FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1144. (Vol. XXII. No. 48.) NOVEMBER 28, 1930 [Weekly, Price 6d. Post free, 7½d. Abroad, 8d.

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2.

Telephone: Editorial, Holborn 1884. Advertising, Holborn 3211.
Telegrams: Truditur, Westcent. London.

Annual Subscription Rates, Post Free.

United Kingdom .. 33s. 0d. United States .. $8·75
Other Countries .. 35s. 0d.*

**Foreign subscriptions must be remitted in British currency.* (*See last Editorial Page*).

CONTENTS

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1930	
Nov. 28	"Importance of the Boundary Layer," Lecture by H. Glauert, before R.Ae.S., Hull.
Nov. 28	"Wapiti in India," Lecture, by Gr.-Capt. R. H. Verney, before Westland Aircraft Soc.
Dec. 1	Extraordinary Conference of the Federation Aeronatique, Paris.
Dec. 4	"The Four-Foot Wind Tunnel," Lecture by H. Glauert, before R.Ae.S.
Dec. 4	Bradford Gliding Club Dance, Queen's Hall, Bradford.
Dec. 5	No. 3 Squadron R.A.F. Officers' Reunion Dinner, Trocadero.
Dec. 5	Ground Engineers' Lecture, by S. J. Norton, before Westland Aircraft Soc.
Dec. 11	"Axial Engines," Lecture by M. L. Bramson, before R.Ae.Soc.
Dec. 11	"Float and Boat Seaplanes," Lecture, by Mr. Jackson, before Westland Aircraft Soc.
Dec. 11	Association Football: R.A.F. v. Fulham, at Fulham.
Dec. 12	Hampshire Ae.C. Dinner and Dance at South Western Hotel, Southampton.
Nov. 28-Dec. 14	Paris Aero Show.
Dec. 17	"Soaring Bird Flight," Lecture by Sir G. Walker, before London Gliding Club.
Dec. 25-26	Association Football: R.A.F. Channel Islands Tour, Jersey.

EDITORIAL COMMENT

AUSTRALIA and Canada are beginning to show the world that what was once thought impossible can actually be done. In both these Dominions some private companies have had the audacity to start regular air services without any subsidy from the Government. It is interesting to speculate on the expressions which would steal over the features of the directors of the Luft Hansa, the Air Union, or Imperial Airways, if it were seriously suggested to any of them that they should do likewise. Were pressure applied, it is not unreasonable to presume that air services would softly and silently vanish away from the European air, and it would be some time before they ever were heard of again. The much-advertised superiority of Continental air mileage over British air mileage would disappear, and the United States and the British Empire would remain the only commercial flying Powers in the world.

Unsubsidised Airways

It is interesting to examine the circumstances which make such a development possible. These things do not happen simply because men of European blood settle in the continents of North America and Australia. Definite causes and effects are certainly at work, and they require study and analysis in order that the moral may be extracted. Aerial transport has not altogether got beyond the stage where enterprising persons push an aeroplane up into the air and hope for the best. The method of trial and error still obtains in some of the Dominion air lines; and it is well that it should be so. Such enterprise is part of the spirit of our race; and if it produces a number of failures, it has also led to many fine achievements. In the main, however, air transport has reached a stage somewhat resembling the position of aircraft design. It is now becoming possible to estimate results by calculating the factors. Factors vary, of course, in different countries, and circumstances may still be found where some factors are unknown and results cannot be foretold with certainty. None the less, a few rules have emerged—rules whose working could not, perhaps, always have been foreseen, but rules which, once they are

recognised, are seen to be reasonable and not to be neglected.

One rule is that, on long journeys, a train which runs for 24 hours on end, travels faster than an aeroplane which cannot fly by night. It is always a dangerous matter to disregard this rule, yet cases still occur. The Canadians seem to have disregarded it at first when they started an air service between Winnipeg and Calgary. If they did, the mistake was soon recognised and rectified. The section from Regina to Calgary is now lighted, and the aircraft of Western Canada Airways fly across it by night. The rule has been successfully defied on the Perth–Adelaide service. The airway there actually follows the railway for 1,453 miles, and the "Hercules" always stops for the night at Forrest; yet, none the less, the machines of West Australian Airways beat the train to such an extent that six days are saved in getting a reply to a letter. This is mainly due to the inefficiency of the railway. That is a point which should always be taken into consideration. A first-class railway is always bad to beat; and, unless night-flying is possible, an airway is usually unwise to enter the lists against it. Even if night-flying is possible, it really only affects the carriage of mails. Passengers will not, if they can avoid it, spend 36 hours on end sitting upright on a seat. To provide sleepers in an aeroplane must cut down the pay-load by about half—a very dubious experiment.

A case which shows the great difference between competing with a good railway and with an indifferent one is the venture of Australian National Airways, Ltd., founded by Kingsford Smith and Ulm. The company receives no subsidy. Last January it started a service, daily in each direction, between Brisbane and Sydney. In June it added a similar service between Sydney and Melbourne. The former was from the outset a brilliant success; the latter has been less successful. In this case one would expect that mails would react less promptly to the different conditions than would passengers, but the mail figures show a striking difference. In the month of July the weight of mails carried on the Brisbane-Sydney service was 2,005 lb.; in the same month, on the Sydney-Melbourne route, it was only 143 lb. This difference is not to be attributed to the longer experience of the northern section. In January, the first month of operation between Brisbane and Sydney, the weight of mails amounted to 600 lb.—a figure which the Sydney-Melbourne route has not yet approached. The explanation lies in the different quality of the train service to the north and to the south of Sydney. The train service to Melbourne is fast and good. To Brisbane it is slow and not good. In the case of passengers the difference is more accentuated than in the case of mails. Melbourne and Brisbane are each about 500 miles away from Sydney. A Melbourne business man who wants to spend a day in Sydney has two choices. He can travel by train through the night, in a proper sleeping compartment, spend the day in Sydney, and return the next night. Similarly a letter posted in the evening reaches a busines office in Melbourne next morning. If the business man decides to fly, he spends part of one day in the aeroplane, sleeps two nights in Sydney, and flies back on the third day. Even if night-flying is instituted on this route, it does not seem that the aeroplane will ever beat the train in the facilities which it can offer.

On the Sydney-Brisbane route the story is different. The railway is of narrow gauge, and the temperature rises steadily as the train gets into Queensland. No sleepers are provided on the train, and night travel is particularly objectionable. Discomfort is the outstanding feature of this journey, and everyone wants to avoid the ordeal if he can. Thus the Avro 10 appears as a boon and a blessing to men. It follows a railway, it is true, but the railway cannot rival it in its own special line of transport. At the same time, there is plenty of traffic between the capitals of Queensland and New South Wales. All the conditions are present which enable an airway to work and earn profits without the aid of a subsidy.

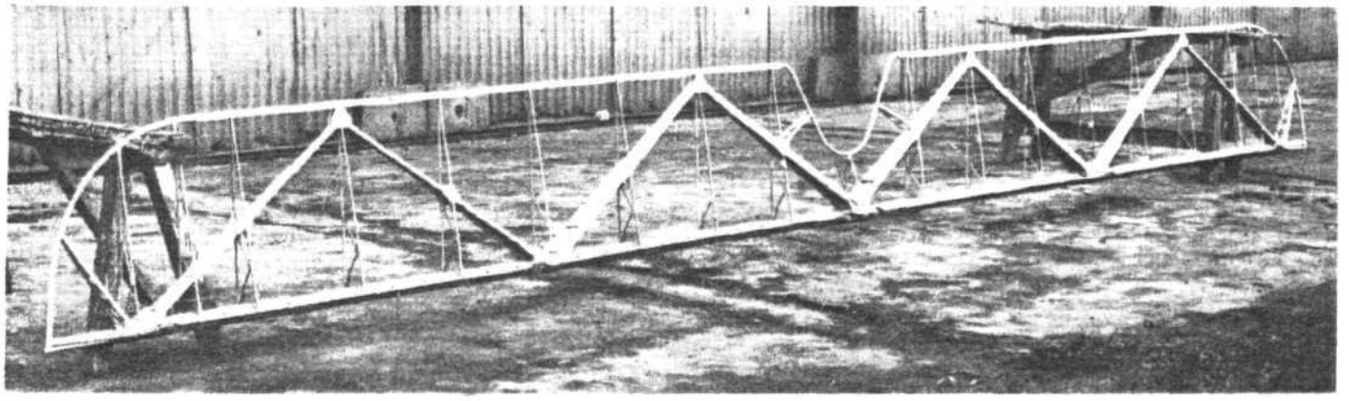
Another feature which has certainly played a part in the success achieved by Australian National Airways is running a daily service. A weekly service is sufficient for lines which work in connection with the weekly mail steamers, as is the case with the Perth-Adelaide service. A weekly service is at present sufficient for lines which run into the grazing tracts of the "out-back," as do the Perth-Wyndham and Brisbane-Camooweal airways. But between capital cities an air service must be daily if it is to win the patronage of business men.

Another case of striking success by unsubsidised airways is to be found in New Guinea. There the circumstances are peculiar, for a gold mine is situated 70 air miles away from its base on the sea. Though the country is jungle, the mine is civilised, and needs constant touch with civilisation. Carriage by air has proved much cheaper, as well as much more expeditious, than carriage by porter. The traffic was ready there, and the airway found no difficulty at all in monopolising it.

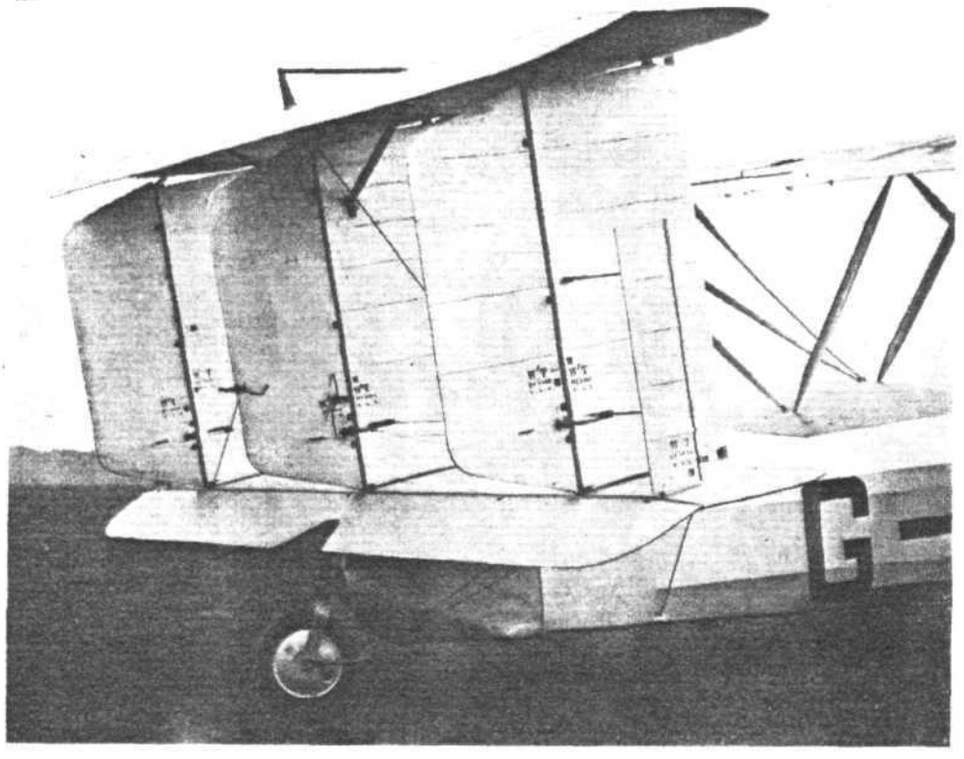
Cases can also be cited from Canada of airways which make good without subsidy; for no Government subsidies are paid in Canada. The same conditions make for success or failure as in Australia. These may be summarised as follows:—An airway has little chance of success when in competition with a good rail service. Where the rail does not exist, or is inefficient, an airway can hold its own. There are two cases of flying into the wilds. One is a more or less humanitarian service into agricultural or pastoral tracts; and there Government assistance of some sort is needed in the early stages. The other case is where industries, such as mines, are established in the wilds, and in that case an unsubsidised airway is likely to make a speedy and handsome profit.

R.A.F. Squadrons

THERE is in progress a very gradual movement of the bomber squadrons from aerodromes on or near the coast to other stations situated behind the defence ring. No. 100 B.S. (Horsley) has recently moved up from Bicester to Donibristle where it will take part in certain exercises in collaboration with the naval forces. This does not mean that the squadron joins the Fleet Air arm; it still remains part of the Wessex Bombing Area under A.D.G.B. Its place at Bicester has been taken by No. 33 B.S. (Hart), which has just moved there from Eastchurch. Eastchurch and Manston are particularly vulnerable aerodromes, as the Thames acts as a guide to take hostile raiders to them. To have our bomber squadrons bombed would be about the worst thing which could happen to us at the outset of a war. No. 9 B.S. (Virginia) will vacate Manston before long, moving to Boscombe Down on Salisbury Plain, where it will later be joined by No. 10 B.S. (Hyderabad), Boscombe Down becoming a night bomber station. Whether Eastchurch and Manston will later be occupied by fighter squadrons remains to be seen.



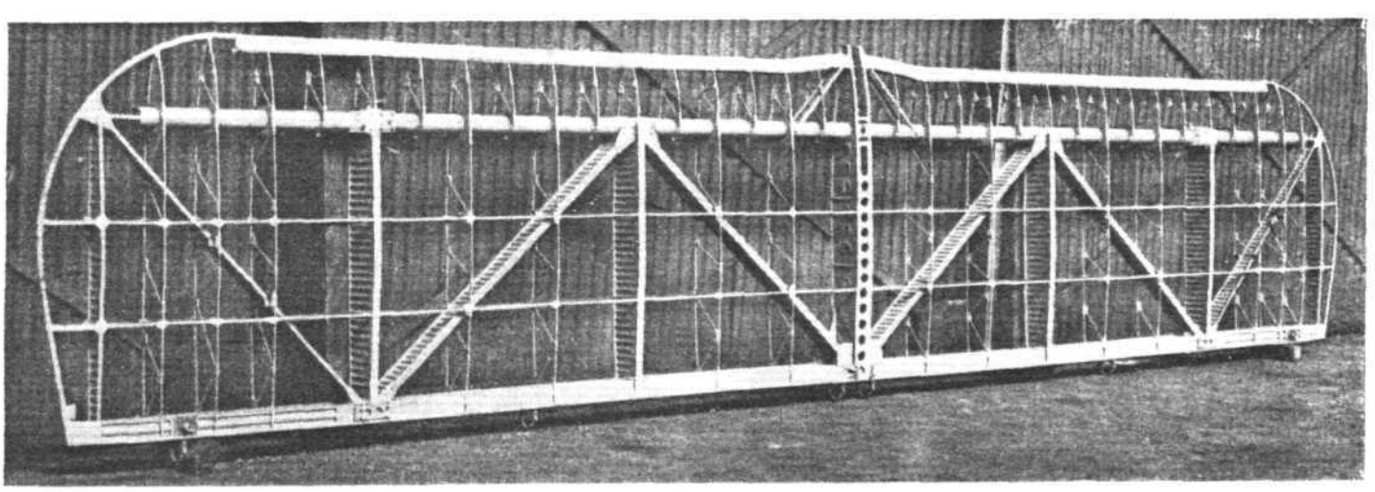
The elevator is of Duralumin construction, with rigid drag bracing.



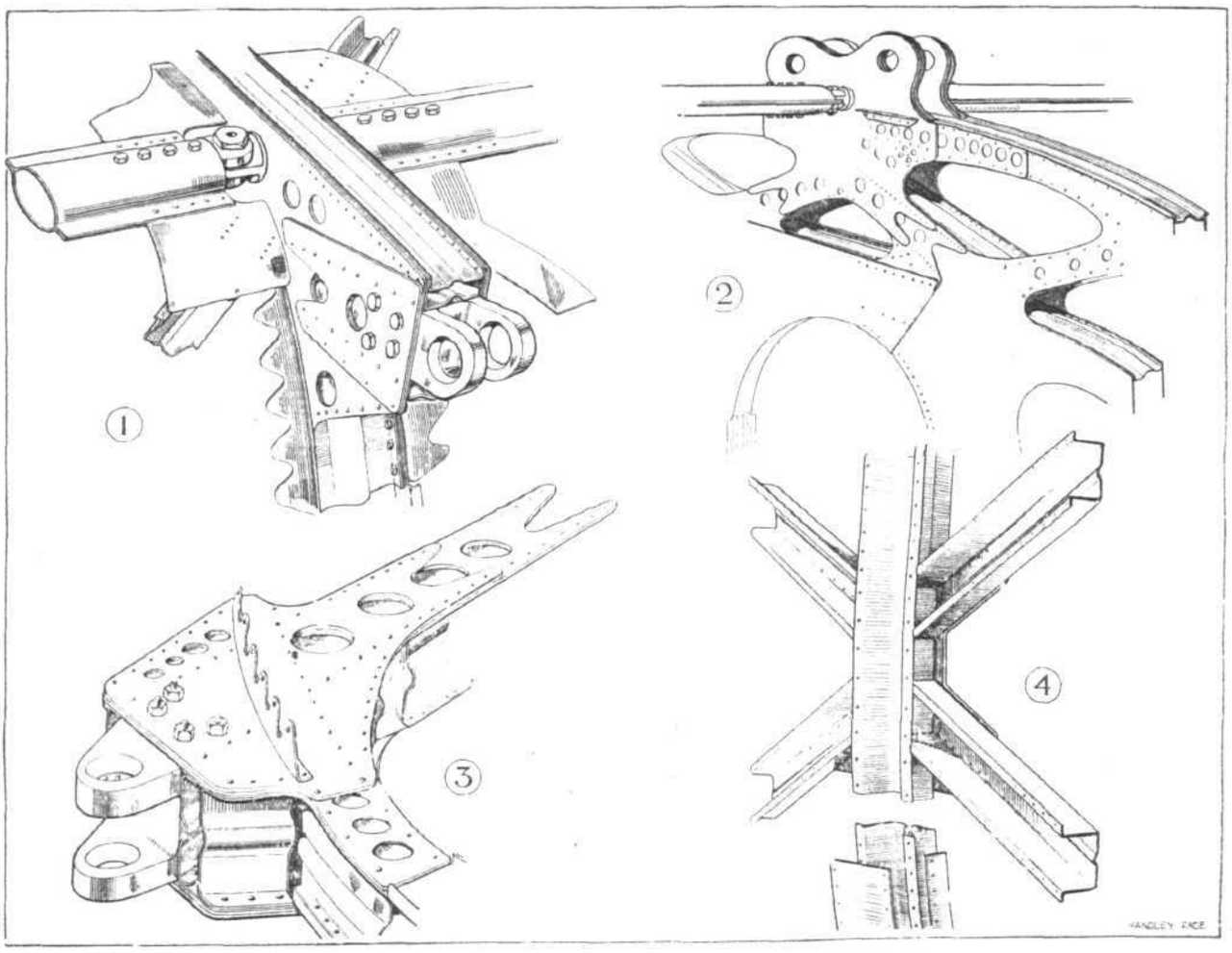
THE TAIL : Rudder balances of an unusual type are used. These take the form of separate surfaces, placed some distance from, but linked to, the outer rudders. The balances are provided with fixed slots.

construction. All highly-stressed parts, such as fittings, etc., are of stainless steel.

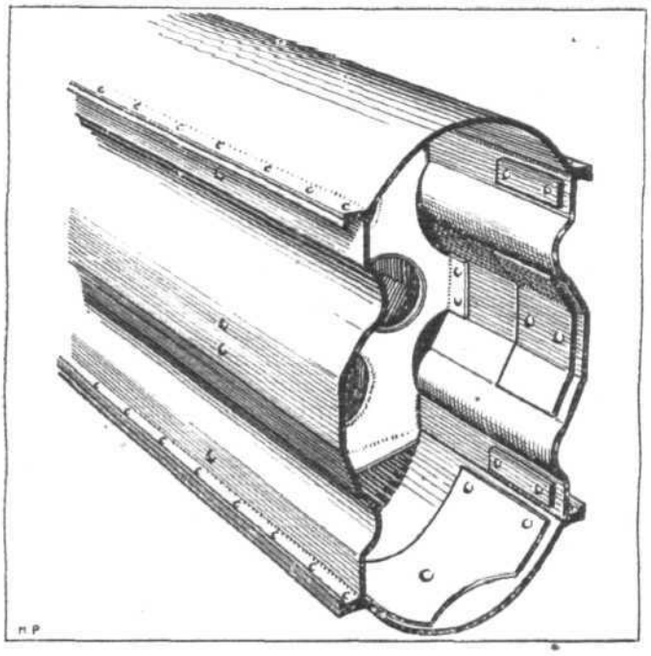
The main wings, of which the upper has an area of 1,999 sq. ft. and the lower an area of 990 sq. ft., are of duralumin construction. The main spars are of the box type, while the wing ribs are of duralumin tube construction. The interplane wing bracing is unusual in that no bracing wires are used, the struts and wing spars forming a Warren girder. The advantage claimed is that no rigging should be required. The interplane struts are, like the spars, of built-up box section and comprise four main members forming the "box," with nose and tail fairings of lighter gauge added. The internal drag bracing is in the form of struts running diagonally from front to rear spars, triangulating the structure and giving a rigid bracing, without wires, which should have the same advantage of absence of rigging as the interplane strut bracing. The internal drag struts are built-up members each consisting of a tube in the plane of the top flange of the spar and one in the plane of the bottom flange, the two tubes being joined by a system of zig-zag members of channel section, riveted to the top and bottom tubes. The interplane strut attachments, stainless steel fittings, are slotted into the spar flanges, which are reinforced by internal and external laminations to stiffen the flange to take the concentrated load.



The tail plane is, like the main wings and control surfaces, of Duralumin construction.



***DETAILS OF FUSELAGE CONSTRUCTION*: 1, shows the bulkhead which carries the front wing spar. Note the section of the longeron. In 2 is shown the bulkhead attachment of interplane struts, while 3 is a corner of the bulkhead carrying rear spar fittings. This was sketched while lying on its side. The details of the diagonal skin bracing are illustrated in 4.**
(FLIGHT *Sketches.*)

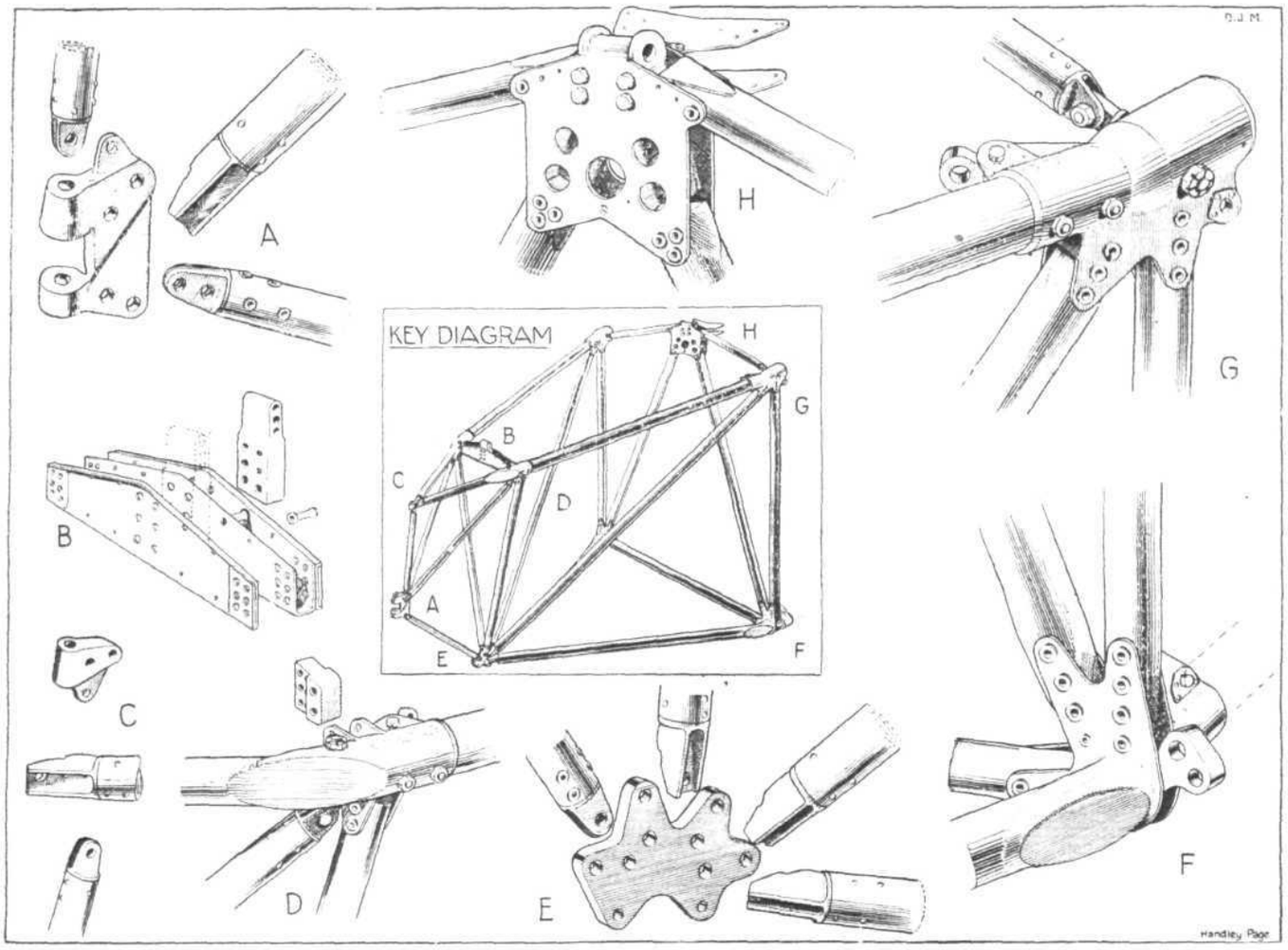


The main wing spars are of built-up box section.
(FLIGHT *Sketch.*)

Automatic slots are fitted to the top plane. The auxiliary aerofoils of the slot mechanism are of a new form of construction, with single spars of Z-section duralumin and a planking or skin of sheet duralumin. The top planking is in the form of narrow sheets with their lateral edges bent up for riveting to the plain, unflanged ribs. The ailerons are of the slot type, and have single spars of circular-section duralumin tube, with tubular ribs. Each aileron is carried on four hinges, supported on box section brackets projecting back from the rear spars. The ailerons are balanced statically and aerodynamically, and are reported to be very light on controls.

The fuselage of the Handley-Page 42 is built in two sections of which the main forward one is a metal *monocoque*, while the rear is of welded steel tube construction. The duralumin longerons of the forward portion are in the form of two corrugated strips with flat flanges, placed face to face so as to form nearly a circular section tube with flat projecting flanges. The fuselage formers or frames, of large size channel section duralumin, are attached to the longerons by angle-section brackets, and the "alclad" plating or covering is riveted to longeron flanges and frames. The planking, although having deep fore-and-aft corrugations, is not relied upon exclusively for the bracing of the fuselage structure. Between vertical frames are diagonal members of "X" formation, riveted to the planking and joined together, where they cross each other, by gussets of sheet duralumin. The construction is probably very strong indeed, but impresses one as being expensive.

The power plant installation is, as already mentioned, unusual. The two lower engines are placed on the lower wings. The engine plates or bulkheads are of duralumin built up to form boxes. These engine plates are supported by welded steel tube structures which extend right aft to the rear wing spars so as to give a very rigid engine mounting. From the lower engines to the fuselage the lower wings slope up to the top of the fuselage so as to avoid piercing the cabin with spars and various obstructions. The result of this "negative dihedral" is that the view from the cabin in a downward direction is not obstructed by the lower plane. The top engines, placed as close together as the airscrew diameters permit, are mounted in a similar manner to the lower, but are slung under the top centre section. The petrol tanks are housed in the upper wing, and give direct gravity



Details of rear portion of fuselage, which is of welded steel tube construction. The key diagram shows extreme stern portion. (FLIGHT *Sketches.*)

feed to all four engines. In the first machine built, the engines are Bristol "Jupiters," series XI, of 490-h.p. each, but there is a possibility that in the "Eastern" model medium supercharged "Jupiters" may be fitted.

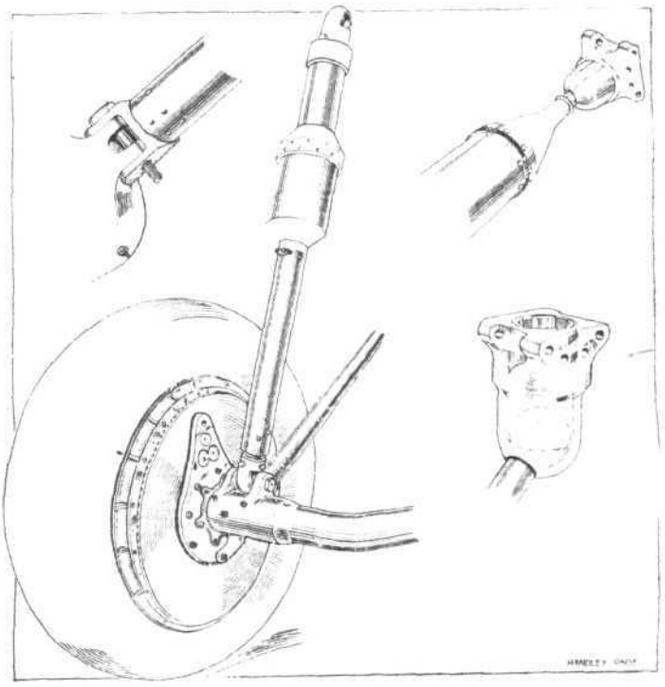
The undercarriage of the Handley-Page 42 is of the oleo-pneumatic type, with bent axles. These are almost a work of art. The tubes are something like 7 in. in diameter, and of T.2 axle material. To make tubes of this diameter in T.2 steel is no mean achievement, and we think it should be placed on record that these were made for Handley-Page's by the Chesterfield Tube Co., Ltd. The undercarriage is of very simple form and low frontal area, as will be seen from the photograph at the head of this article. Dunlop wheels with Palmer brakes are fitted.

The pilots' cab of the 42 is, as already mentioned, very roomy and so placed as to give an entirely unobstructed view in all essential directions. The controls are in duplicate, the elevator and aileron controls taking the form of a large-diameter Y-tube, the upper limbs of which each carry a wheel.

Adjustable footbars are provided, and the seats are also adjustable. The engine controls are arranged in a somewhat unusual manner. A "lost motion" mechanism is incorporated, so that the first few degrees of movement of the throttle levers do not open the throttles on the engines but merely turn on the petrol. Thus it is impossible for the pilot to forget to turn the petrol on to one of the engines. Also a certain amount of extra control leads are saved, which is not unimportant in a machine of the large dimensions of the 42.

The control lever of the Palmer wheel brake system is centrally placed, within reach of both pilots, and is very neatly so arranged that a straight-back movement of the lever applies both brakes, while a diagonal movement to one side or other applies one or other of the brakes.

Altogether, the Handley-Page 42 is an unusually interesting machine, and it will be instructive to watch its behaviour when it is put into service.



One-half of the Oleo-pneumatic undercarriage. The ball and socket joint of the radius rod has an internal plug of phosphor bronze, screwed into the outer casing and locked in position by the bolts passing through the castellations in the top of the bush. (FLIGHT *Sketch.*)

THE ROYAL AERO CLUB OF THE U·K.

OFFICIAL NOTICES TO MEMBERS

Aviators' Certificates.—The following Aviators' Certificates were granted :—

9551	Hon. Richard A. Erskine	Northants A.C.
9552	Evadne Flower	Northants A.C.
9553	Sidney Harper Paxton ..	Newcastle A.C.
9554	Charles Coombes	Isle of Wight Fl. C.
9555	Laurie J. Gudgeon-Bayliss	Midland A.C.
9556	John Charles Shirley ..	Midland A.C.
9557	Meruyn Caverhill Mander	Midland A.C.
9558	Marie Violet S. Brand ..	Suffolk and E. Co. A.C.
9559	David A. Hutton Bannerman	Suffolk and E. Co. A.C.
9560	Arthur Edward Dobell ..	Lancashire A.C.
9561	Charles William Crawley..	Marshall's Fl. School.
9562	Francis William Carson ..	Nottingham A.C. (N.F.S.)
9563	Hassan Mohammad Anis, Pasha	Phillips and Powis Fl. School.
9564	Carl Sven Hansen.. ..	Berks, Bucks and Oxon A.C. (N.F.S.).
9565	Leonard Emil Hough ..	Hanworth Club (N.F.S.).
9566	Leslie Mark Williams ..	Surrey Fl. Services.
9567	Kenneth Garston-Jones ..	Ex R.A.F.
9568	William Arthur Dawson ..	Nottingham A.C. (N.F.S.)
9569	Humphrey William Butler	Airwork Fl. School.
9570	Sydney J. W. Meathrel ..	Home Counties Acft. Services.
9571	John A. C. Houghton ..	Norfolk and Norwich A.C.
9572	Douglas C. L. Love ..	Bristol and Wessex A.C.
9573	Percival Henry Meadway	Private Tuition.
9574	Thomas Bradford ..	Nottingham A.C. (N.F.S.)
9575	Henry Marcus Scottorn ..	Nottingham A.C. (N.F.S.)
9576	Alexander Duncan Baxter	Liverpool and Dist. A.C.
9577	William James Beaumont	Scottish Fl. C.
9578	Lois Olive White	Hanworth Club (N.F.S.).
9579	Keith Pyman	De Havilland Fl. School.
9580	John Clement Hoyland ..	Yorkshire A.C. (N.F.S.).
9581	Henry George Sherwood..	Phillips and Powis Fl. Sc.
9582	Charles Edward Simms ..	Hanworth Club (N.F.S.).
9583	Arthur de Hauteville Bell	Hanworth Club (N.F.S.).
9584	Henry John Searle ..	Cinque Ports Fl. C.
9585	Maxine F. M. Freeman-Thomas	Southern A.C.
9586	Sylvia Maud Dunsford ..	Home Counties Acft. Services.
9587	John Sclater Georgeson ..	
9588	Kenneth Graham Greenacre	
9589	Edward Harry Paul ..	
9590	Edward H. F. Fuller ..	Hanworth Club (N.F.S.).
9591	Arthur Leonard Birch ..	Phillips and Powis Fl. School.
9592	Bryan Frederic Marriage..	Suffolk and E. Co. A.C.
9593	Lawrence Alexander Lafone	Airwork Fl. School.
9594	William Edward Cotton ..	R.A.F.

Gliding Certificates.—The following Gliding Certificates were granted :—

8.	Denys Max Thomson Morland	London Gliding Club.
9.	Col. The Master of Sempill	London Gliding Club.
10.	John Raymond Ashwell-Cooke	London Gliding Club.
11.	Alan Goodfellow	Lancashire Aero Club.
12.	Mrs. Dorothy Joan Bradbrooke	London Gliding Club.
13.	Thomas Graham Humby..	London Gliding Club.
14.	Leonard Charles Williams..	London Gliding Club.
15.	Harry Amein Abdallah ..	London Gliding Club.
16.	Percy Michelson	Lancashire Aero Club.
17.	Frederick Basil Tomkins ..	Lancashire Aero Club.
18.	Eric Christopher Stanley Megaw	London Gliding Club.
19.	Basil Alfred Gregory Meads	Lancashire Aero Club.
20.	Robert Gidner Spencer ..	Duffield and District Gliding Club.
21.	John Cecil Weale	Lancashire Aero Club.
22.	Reginald George Robertson	London Gliding Club.
23.	Thomas Eaton Lander ..	London Gliding Club.
24.	Hamish Allan	London Gliding Club.
25.	Wm. James Molony Spaight	Nottingham Gliding Club.
26.	Joseph Meyler Symmons ..	London Gliding Club.
27.	Alexander Nelson Stratton	Surrey Gliding Club.
28.	Alan Fleming McGlashan..	Surrey Gliding Club.
29.	Alan Herbert Reffell ..	Surrey Gliding Club.
30.	Frederick Slingsby ..	Scarborough Gliding Club.
31.	Stanley Cecil Howard ..	Scarborough Gliding Club.
32.	Thomas Littleton Green ..	Kent Gliding Club.
33.	Norman Llewellyn Bowden Puttock	Portsmouth Gliding Club.
34.	John Craven Barnes ..	Scarborough Gliding Club.
35.	Frederick Louis Gardiner..	Scarborough Gliding Club.
36.	Edward Hedley Fielden ..	London Gliding Club.
37.	Graham Andrew Little ..	Surrey Gliding Club.

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3, CLIFFORD STREET, LONDON, W.1.
H. E. PERRIN, Secretary

GUILD OF AIR PILOTS AND AIR NAVIGATORS OF THE BRITISH EMPIRE

ON Monday night, November 24, the Guild held its first annual meeting, and Capt. A. G. Lamplugh gave a report of the affairs of the Guild to date. He said that the membership had increased until the number of full members now stood at 103. With regard to the Employment Bureau which had been formed, he said that this had already been in operation a sufficient time to show that it would become increasingly useful. Education and training of the professional pilot of the future, he said, has always been one of the principal duties of the Guild, and a sub-committee which was formed by Lord Thomson, consisting of Capt. Tymms (Chief Technical Assistant to the Directorate of Civil Aviation), Mr. Wingfield and Capt. Lamplugh himself, have been examining the whole position. The main lines of their recommendation is the formation of a university or school, to be called "The Imperial School of Air Pilotage," where it is proposed that a one or two years' course will be given in practical air pilotage and navigation, seamanship, maintenance of equipment operations, traffic, meteorology, economics of air transport, and international regulations. With regard to pilots' licences, it was felt that it was for the Guild to see that injustice caused to "B" licence holders by unfair competition from holders of "A" licences was eradicated. The Guild had also been successful in inducing the Air Ministry to issue a new type of "B" licence, whereby the anomaly which up to the present has existed, limiting "B" licence pilots to certain named types of aircraft, was changed, and this new type would authorise the pilot to fly named types carrying passengers or goods for hire or reward, and all other types, unnamed, for industrial purposes. Arrangements had been concluded whereby members of the Guild could obtain insurance against loss of their "B" licences on special terms. Capt. Lamplugh pressed that it was felt to be in the interests of aviation generally that the official findings of all accident investigation committees should be made public, thereby vindicating the pilot wherever this was possible. A prize for the best feat of civil air navigation is, he said, to be presented in commemoration of the work of the late Sqd.-Ldr. Johnston, and the Guild was open to receive donations for this. The Guild has invited the Air Ministry to support their plea for the exemption of pilots from jury service. Capt. Lamplugh wished, without detracting in any way from the sorrow of others, to say that the greatest sufferer of the crash of the R.101 was the Guild, they having lost several members, including their first Master, Deputy-Master and Founder, in the persons of Air Vice-Marshal Sir Sefton Brancker, Sqd.-Ldr. Johnston, Lt.-Comm. Atherstone and Mr. Giblett, who announced that Sqd.-Ldr. the Hon. F. E. Guest had been co-opted a member of the Court and had accepted the position of Deputy-Master.

MRS. BRUCE REACHES TOKIO

BY her arrival in Japan after a flight of nearly 11,000 miles from England, which she left on September 25, the Hon. Mrs. Victor Bruce has definitely proved her ability as a pilot and the remarkable qualities of the British light aeroplane, of which her "Bluebird" is typical.

She has flown from Heston to Japan (Osaka) in 24 flying days, or a total elapsed time from start of 61 days, and she has flown over some of the most difficult country that could be found. Her 600 miles flight over the Yellow Sea from Shanghai to Seoul is in itself a remarkable achievement for a pilot who learned to fly in the same year.

Mrs. Bruce's ambition was not to create a speed record, but to be the first British pilot to fly solo to Japan. In this she has succeeded, and admiration has been roused by the tenacity and courage which has enabled her to do the journey alone, involving perils, discomforts, and severe tests to her navigating ability, after only 40 hours' flying experience.

Perhaps the most interesting feature of Mrs. Bruce's flight is the fact that she has recorded her impressions of the flight as she flew, by means of a Dictaphone—the records for the section England–Karachi have already been sent by air to this country. The use of the Dictaphone in this way appears to us to open up great possibilities, and we hope to have something to say on this subject on a future occasion.

Leaving Heston at dawn on Thursday, September 25, in the Blackburn "Bluebird" (D.H. "Gipsy II" engine), she flew to Frankfurt, refuelled and went on to Munich. On the 26th she reached Vienna, and by the 28th she had landed at Constantinople, via Budapest and Belgrade. On October 1 she made a forced landing at Eski Shehr, was rescued by Arabs, and after obtaining help, restarted the machine, again forced-landing at Konia. On the 3rd and 4th she stopped at Bagdad and Bushire, but forced-landed in a wild country inhabited by Baluchi tribesmen, 45 miles from Jask, on the 7th. Here her machine was delayed, and although exhausted and discouraged, she wired to her husband that only mechanical difficulties would prevent her from carrying out her programme of flying to Tokio. The mechanical difficulties having been put right by the 25th she flew to Karachi, and proceeded via Jodhpore, Allahabad, Calcutta, Rangoon, Bangkok, Korat, Lakhon, Hanoi, Fort Bayard, Hong Kong, Amoy to Shanghai, which was reached on November 14. From there she flew on November 18 across the Yellow Sea to Seoul, and, on November 21, from Seoul across the Korean Straits (about 160 miles over water) to Osaka, where she was accorded a very hearty welcome to Japan from both Japanese and British.

The final stage of her big flight to Tokio was completed on November 24, when she flew 145 miles from Osaka and, escorted by a number of Japanese 'planes, landed on the Tachikawa Aerodrome amidst enthusiastic demonstrations of welcome from several thousand of Japanese and European spectators. One of the escorting machines was piloted by Miss Boku, the Korean airwoman.

Mrs. Bruce was "chaired" on the shoulders of two Englishmen to the pavilion, where there were several presentations, etc., after which she drove into Tokio, where various functions were held in her honour. It is understood that Mrs. Bruce will remain in Tokio about a fortnight, and will then ship the "Bluebird" to Vancouver, whence she will fly to her mother's home at New Albany.

The log of Mrs. Bruce's flight to Tokio is as follows :—

Sep.	25	Heston-Frankfurt-Munich (600)*.	Oct.	29	Arrived Calcutta (520).
,,	26	Arrived Vienna (200)	,,	30	,, Rangoon (700)
,,	27	,, Budapest-Belgrade (400)	,,	31	,, Bangkok (370).
,,	28	,, Constantinople (500)	Nov.	1	,, Korat (140).
,,	30	Forced landing, Eski Shehr (150)	,,	3	,, Lakhon (250).
Oct.	1	Arrived Konia (250).	,,	6	,, Hanoi (300).
,,	3	,, Baghdad (700).	,,	8	,, Ft. Bayard (—).
,,	4	,, Bushire (600).	,,	9	,, Hong Kong (550).
,,	7	Forced landing near Jask	,,	12	,, Amoy (300).
,,	25	Arrived Karachi (1,000).	,,	14	,, Shanghai (550).
,,	27	,, Jodhpore (400).	,,	18	,, Seoul (600).
,,	28	,, Allahabad (550).	,,	21	,, Osaka (550).
			,,	24	,, Tokio (150).

25 Flying days 61 elapsed days. Total distance 10,330 miles.

* Approximate mileage.

CROYDON WEEKLY NOTES

THE search for news at Croydon this week has probably been harder work than any other done on the aerodrome. In such weather as we have had those who run the transport services have salted their zeal with discretion. So successfully indeed have they done it there is little to report.

The lines have all been hindered by the severe gales and many machines have had to put down at intermediate aerodromes, or arrive very much overdue. This is good, for however heroic may be the spectacle of a pilot driving on against overwhelming conditions, it does little to inspire the public with feelings of comfort and safety. And those feelings are exactly the ones which must be fostered at present, even at the expense of irregularity of service. The passenger list at 320 and the cargo weight at 36 tons are slightly below last week's figures.

The annual dinner which is given by the Imperial Airways pilots to the mechanics was held at Rules, in Maiden Lane, last Tuesday, November 18. It was a bright affair and showed in full the good feeling which exists between the two parties.

This seems a suitable place to remark that a better name than "mechanic" might be found for those who carry the responsibility of such highly technical work as theirs.

Mr. Bernard Wilson and Mr. J. H. Wybrant have distinguished themselves by qualifying for their Royal Aero Club "A" tickets for gliding. We believe that these two are the first qualified glider pilots at Croydon. They went last week to Scarborough to watch the exploits of Herr Magersuppe, with whom they "glid" in his two-seater. Mrs. Wilson, who shares all her husband's enthusiasm for the air, was also a passenger. The Scarborough Club, they say, is very successful and has nearly 140 flying members. Mr. Howard, the club's president, is also manager of the Royal Hotel, Scarborough. We must add his name to the list of those who know best what flying folk want and who set out to give it to them, a list which already includes Mr. and Mrs. Somerville, of the White Hart at Hythe, and Mr. Atkins, of the Aerodrome Hotel, Croydon. Rules, too, seems to be developing a very airy atmosphere in its aged rooms.

We have been favoured with a visit from Mr. G. Henderson, who, after representing his company in Belgium, Germany and Switzerland, now looks after the Paris end of Imperial Airways. He is most popular there and everyone speaks of his patience and help for those in difficulties.

The Saturday evening papers displayed large photographs of an unnamed light aeroplane which was to revolutionise flying by bringing its cost down to a halfpenny per mile. The machine was, of course, a Robinson "Redwing," built by the Robinson Aircraft Co., Ltd., of Croydon. This machine has just been tested for aerobatics by Flight-Lieut. N. M. S. Russell, and appears to be very slick in spite of its exceptionally easy flying qualities. Its C. of A., all up weight, has just been increased to 1,450 lb. for normal flying, and to 1,250 lb. for aerobatics.

Another tri-motor Ford, with Pratt and Whitney "Wasp" engines, reached us this week-end from America, having been re-assembled in a few hours at Hooton, near Liverpool. It is destined for the International Aero Show in Paris, and we understand has been specially fitted out for the private owner. Its accommodation looks tasteful and comfortable. The engines are fitted with electric starters.

Two other importations from America also arrived about the same time. These are power gliders built by the Aeronautical Corporation of America. They have tubular steel fuselages and 30-h.p. horizontal twin-cylinder, air-cooled motors. One is a side-by-side two-seater, and the other a single-seater with lift for 50 lb. of luggage. The performance in a high gale of wind and rain on Monday afternoon was really startling and appeared a match for the Gugnunc, Pterodactyl or Autogyro. We must see more of them.

Cirrus Aero Engines, Ltd., have just completed a most gruelling test at Croydon on their "Hermes II." After a hundred hours at 2,000 r.p.m., it was put on for a further run at 2,300 r.p.m., and stood up successfully with no failure of any kind. At these speeds it developed 110 h.p. and 117½ h.p. respectively.

M. L.

AIR MINISTRY NOTICES

AIR MINISTRY NOTICES TO AIRCRAFT OWNERS AND GROUND ENGINEERS

Farnborough Rotating Wireless Beacon

1. AN experimental rotating wireless beacon has been installed at the Royal Aircraft Establishment, Cove, near Farnborough, Hampshire. (Lat. 51 17' 13" N.; long. 00° 46' 43" W.)

2. As from November 1, 1930, and until further notice, a limited routine service will be carried out on Mondays to Fridays inclusive, as follows :—

(*a*) A two and a half hours' transmission between 1000 and 1230 G.M.T.

(*b*) A two hours' transmission commencing at sunset.

3. This beacon is similar in type to the Orfordness Beacon referred to in Notice to Airmen No. 56 of 1929 (N/A General Notice No. 1 of 1930 Reprint No. 24), and A.M. Pamphlet No. 38 entitled, "Orfordness Rotating Wireless Beacon, Instructions for Taking Bearings" should therefore be consulted for a brief description of the beacon, the method of working, and the manner in which it can be utilised as an aid to navigation.

4. The essential particulars of the two beacons are as follow :—

	Orfordness.	*Farnborough.*
Call sign	G.F.P.	G.F.T.
Frequency	288·5 K.C.'s.	288·5 K.C.'s.
Wave-length	1,040 m.	1,040 m.
North Signal	V.	G.
East Signal	B.	W.

5. It should be noted that the Farnborough beacon, when working, will operate during the five-minute intervals in which the Orfordness wireless beacon is silent, *i.e.* :—

Orfordness at 00–05, 10–15, 20–25, 30–35, 40–45, 50–55 minutes past the hour.

Farnborough at 05–10, 15–20, 25–30, 35–40, 45–50, 55–60 minutes past the hour.

Care should therefore be taken not to confuse the signals from these two beacons.

6. The object of the installation of this second beacon is to test the general utility of this system of direction finding and to ascertain in particular whether, by obtaining bearings from the two beacons, aircraft can fix their positions with sufficient accuracy for practical purposes.

7. All pilots and radio operators are therefore invited to take every opportunity of ascertaining as far as possible the accuracy of individual bearings from each beacon as well as of position fixes.

When such tests are being carried out, it is essential that aircraft should be in known positions, and, unless single bearings only are being taken, it is desirable that the angle subtended by the two beacons should normally lie between 60° and 120°.

8. Reports, which should be forwarded to the Secretary (C.A.4), Air Ministry, should in all cases show the actual position of the aircraft, the time of the observation, and where applicable, the angle of cut. In addition, information as to the effective maximum range of the two beacons during the day and night, and at sunrise and sunset, will be specially valuable.

General Notice (*No.* 31 *of* 1930)

Provision of Safety Belts or Harness in Closed Cockpit Aircraft

1. SAFETY belts or harness of an approved type must be provided for the pilot's seat in all closed cockpit or cabin type heavier-than-air aircraft. The installation of the safety belt or harness must satisfy the requirements of paragraph 4 of Design Leaflet E.3 of Air Publication 1208, Airworthiness Handbook for Civil Aircraft.

2. The above requirement will, in due course, be introduced into Section VII of the current Air Navigation Directions.

3. It will be brought into effect as follows :—

(*a*) On January 1, 1931, in the case of aircraft in respect of which original Certificates of Airworthiness are issued on or after that date.

(*b*) From January 1, 1931, in the case of aircraft in respect of which application is made on or after that date for renewal of an existing Certificate of Airworthiness.

NOTE.—For safety belt and harness requirements in connection with open cockpit aircraft, *see* Notice to Aircraft Owners and Ground Engineers No. 6 of 1930.

(*No.* 37 *of* 1930.)

Heating Systems of Cockpits and Cabins

1. THE attention of aircraft owners, ground engineers and all concerned is drawn to the fact that heating systems which depend on jacketted exhaust pipes may, under certain circumstances, develop leaks which will enable exhaust gases containing carbon monoxide to enter the cabin or cockpit.

2. Frequent examination of the exhaust pipes concerned should be made, particularly of the portions within the jacket or muff, to ensure that they are adequately gas-tight.

(*No.* 38 *o* 1930.)

D.H. 80.A. "Puss Moth" Aircraft : Rudder Control Lever

1. ON certain aircraft of the above types, the rudder control lever, part No. H.30300A situated immediately behind the cabin, has been found to be below strength, and trouble may be experienced, particularly if severe rudder bar loads are applied while the machine is on the ground.

2. This control lever is, therefore, to be removed and replaced by part No. H.30300A modified, or by part No. H.33163A. The manner of making this replacement is shown on drawing No. M.1502, copies of which may be obtained from the De Havilland Aircraft Co., Ltd.

3. The modification is necessary in the case of the following aircraft only :—
Constructor's Nos.—2001 to 2037, 2039 to 2063, 2068 to 2072, 2077, 2080 to 2085, 2090, 2091, 2093.

4. This modification is to be incorporated on all the above aircraft within two months from the date of this notice. No Certificate of Airworthiness in respect of any of the above aircraft will be renewed until the modification has been satisfactorily incorporated.

(*No.* 39 *of* 1930.)

Simmonds "Spartan" Aircraft, fitted with Main Planes of Symmetrical Section

1. THE attention of aircraft owners and ground engineers is drawn to the fact that distortion of the compression box ribs at the interplane strut attachment has occurred in aircraft of the above type.

2. These ribs should be examined immediately in all Simmonds "Spartan" aircraft fitted with main planes of symmetrical section.

3. Where replacements of these ribs are found to be necessary, Part No. 669 should be fitted.

4. No Certificate of Airworthiness will be renewed unless the above modification has been satisfactorily incorporated.

5. This notice does not apply to aircraft of the above type, which may be found to have compression box ribs in accordance with Sketch No. 158, fitted in upper and lower planes at the interplane strut attachment.

(*No.* 40 *of* 1930.)

Examination of Applicants for Ground Engineer's Licences

1. EXAMINATION boards will sit for the purpose of examining applicants for ground engineers' licences at the following times and places :—

(*a*) London, on the first and third Wednesdays in every month.
(*b*) Croydon, on the second Wednesday in every month.
(*c*) Manchester, on the first Wednesday in January and April.
(*d*) Birmingham, on the first Wednesday in February and May.
(*e*) Bristol, on the first Wednesday in December and March.

2. Applications for licences should be made on the appropriate form, which is obtainable on request, and should be addressed to The Secretary, Air Ministry (D.C.A.), Gwydyr House, Whitehall, London. Applications for extensions to existing licences will also be dealt with at these boards, and such applications should be sent either by letter or on the usual application form to the address given above.

3. Applications for examination at the centres named at 1 (*c*), (*d*) and (*e*) above, can only be accepted provided that the application is received 14 days before the dates specified and provided also that the total number of applications received are within the capacity of the board. Applicants whose applications are not accepted owing to these provisions will be given the opportunity for early examination at London or Croydon, or, alternatively, to be placed on a waiting list for the next board to be arranged in the particular place concerned.

4. Notice to Aircraft Owners and Ground Engineers No. 18 of 1930 is hereby cancelled.

(*No.* 41 *of* 1930.)

Avro 504.K and 504.N Aircraft : Discontinuous Elevators

THE requirement regarding discontinuous elevators, as set out in Design Leaflet B.4 of Air Publication 1208, and in Section A of Notice to Aircraft Owners and Ground Engineers No. 24 of the year 1930, is not applicable to aircraft of the above types.

(*No.* 42 *of* 1930.)

Certificates of Airworthiness—Acrobatic Category : Flight Requirements—Provision of Parachutes and Safety Harness. (Landplanes and Seaplanes)

THE attention of all aircraft owners and ground engineers is drawn to the fact that the following footnote has been added to Design Leaflet F.1, and will be brought into effect as from the date of issue of this Notice :—

"Note.—Attention is drawn to the following requirements for all aircraft submitted for official flying trials prior to the issue of a Certificate of Airworthiness in the Acrobatic Category :—

(1) Provision is to be made for the fitting of four-piece safety harness of an approved type in the pilot's seat, if an approved type of harness is not already installed.

(2) Provision is to be made for the carrying of seat-type parachutes by personnel when testing the aircraft.

(3) The design of cabin or enclosed cockpit aircraft must be such that easy egress from the cabin is possible should a parachute descent be necessary."

(*No.* 43 *of* 1930.)

D.H. 80.A. "Puss Moth" Aircraft : Aileron Controls

1. CASES have occurred of the aileron controls of the above type of aircraft becoming partially jammed at either of two points. The first of these is where the aileron control cable passes through the rear floor of the cabin; small nuts, screws, etc., may fall down the hole and lodge in the aileron chain below, and so jam in the pulley. The second is where the trailing edge flap hinges up to allow folding of the wings; unless proper care is used when the flaps are being shut, the aileron cable may be left hanging in a loop which is jammed as the flap comes down.

2. To eliminate these risks, two modifications have been introduced. The first consists of two light aluminium covers, part No. H. 33279, for the cable where it passes through the floor, these being secured as shown on drawing No. M. 1514. The second consists of fitting an aluminium channel guard, part No. H. 33495, over the exposed length of cable, and a fibre block, part No. H. 33496, as shown on drawing No. M. 1531.

3. Arrangements are being made by the makers of the aircraft to supply to all owners the necessary parts and drawings. If these are not received in due course, application should be made to the de Havilland Aircraft Co., Ltd., Stag Lane Aerodrome, Edgware, Middlesex.

4. The above modifications are to be incorporated in all aircraft of the type in question within two months from the date of this notice.

5. No Certificates of Airworthiness in respect of any such aircraft will be renewed until the modifications have been satisfactorily incorporated.

(*No.* 44 *of* 1930.)

Westland Aircraft Society

THE lecture on "Recent Long Distance Flights," which was to have been delivered before the Westland Society (Yeovil Branch of the R.Ae.S.) on December 5, has been postponed owing to the ill-health of Capt. Barnard. Instead, Mr. S. J. Norton will give a lecture for ground engineers.

The Society of Engineers

AT the next ordinary meeting of the Society of Engineers, which will be held on December 1 in the apartments of the Geological Society, Burlington House, W., at 6 p.m., Mr. W. R. Baldwin-Wiseman, M.Sc., M.Sc. (Eng.), A.M.I.C.E., F.S.I., late Flt.-Lieut. R.A.F., will read a paper on "Some Ground Aspects of Aviation." In his paper the author reviews the pre-war, war and post-war development of aviation, and stresses the necessity of planning an adequate ground equipment if airmindedness is to be more generally cultivated and civil aviation is to pass more rapidly from the present subsidised stage to that of a self-supporting express transport system. He then describes the essential requirements of an aerodrome : the preparation of the site; the outline, dimensions, classification, and marking of an aerodrome; the location and construction of runways, landing strips, hangars, and other buildings; also the lighting and wireless equipment of aerodrome and airways.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

November 28, 1930

CONTENTS

TECHNICAL FEATURES OF THE AIR MAIL.

By Frank Radcliffe, B.Sc., A.M.I.A.E., A.R.Ae.S.

(*Continued from p.* 74.)

IV.—Design for a Mailplane

The purpose of this article is to point out some of the outstanding features which need investigating and solving if one wishes to arrive at the *ideal* mailplane. The problem, at its best, is a compromise and the designer must so arrange the conflicting features that a true perspective is obtained and a reasoned choice decided upon. What is ideal for one section of an air route, will not necessarily be quite so efficient for another. Thus it is necessary to state at the outset that *there is no ideal type for a mailplane, but there might be an ideal type for a given set of conditions which appertain to a certain section of air route.*

In the light of the above, the writer will endeavour to state the conditions and then point out what were the reasons for arriving at the design illustrated in Fig. III.

The mailplane considered was one suitable for operation on routes with Croydon as the centre and linking up important cities 750-1,000 miles distant. Such a service would enable a business man in London to have the whole of Western Europe within reach of an evening's post, *i.e.*, would make Madrid, Rome, Vienna, Prague, and Berlin easily as near, from the point of view of time, as Manchester or Newcastle.

Choice of Design.—The projected design as outlined in Fig. III, is an orthodox, single-engined, high-wing cantilever *all*-metal monoplane powered with an Armstrong Siddeley "Leopard" engine of 813 b.h.p. at normal r.p.m. The body and wings are metal-covered to reduce fire risks, and the only refinements applied to the aircraft from an aerodynamic aspect are:

(*a*) The avoidance of all sharp corners on the body cross-section, and the approach to the best streamline shape;

(*b*) the fitting of a broad Townend ring to serve the dual purposes of exhaust ring and of smoothing out the air flow over the body; and

(*c*) the fitting of "spats" over the wheels to reduce the wheel drag and undercarriage interference drag.

Brakes are assumed fitted to the landing wheels to reduce the landing run, and, if independently operated, would give better ground manœuvrability. A tail wheel is indicated in the side view, and this has been faired into the fuselage as well as possible. In order to reduce the drag of the undercarriage still further, internally sprung wheels have been assumed. This further simplifies the fitting of the "spats" and enables the fitting of air brakes, in the form of rotating front track struts, to be simplified.

A high wing monoplane has been chosen in preference to a biplane, or a low wing monoplane, for the following reasons:

(1) Elimination of rigging in service.

(2) Stowage of a simple gravity petrol system within the wings.

(3) Highest degree of aerodynamic efficiency of this form of body and wing combination.

(4) The relatively bigger chord of the monoplane compared with the equivalent biplane should allow of bigger variations of loadings (*i.e.*, a bigger travel of C.G.)

(5) The pilot is able to sit forward of the leading edge of the high-wing monoplane and so has a better view forward and down than in the other schemes.

Choice of Engine.—This may give rise to some discussion so that a few notes on the reason for its selection may not be out of place at this juncture. It was decided from the outset to investigate a design which would be possible with existing engines. This being postulated, three courses are open for consideration:

(1) A radial air-cooled engine;

(2) A water-cooled engine;

(3) A series of smaller engines, either air-cooled, or water-cooled.

From an aerodynamic standpoint the water-cooled engine has strong claims for consideration. By means of the latest steam-cooling methods it would be possible to reduce the body size to a minimum whilst the drag from the steam radiator would be almost negligible. After weighing up carefully its merits the writer felt that the air-cooled engine could certainly put up a stronger case on other counts:—

(*a*) The easier maintenance of an air-cooled engine due to the absence of cooling installation troubles was a factor not to be lightly disregarded, especially as the fitting of an efficient Townend ring would enable the drag of the air-cooled engine and fuselage to be reduced to a very satisfactory amount.

(*b*) The bigger body behind the air-cooled engine would add to the comfort of the crew and facilitate the use of apparatus for picking up and dropping mail bags.

The use of several power units was investigated, but for the special purpose of a mailplane it was felt that the multiplicity of power units meant also the increasing of possibilities of breakdown, the increasing of maintenance costs on the aircraft to the operation company and a decided increase in the overall drag of the aircraft.

The recent refuelling duration flights carried out in America (U.S.) indicate that engine reliability can be improved tremendously, and with one engine to look after instead of three the overhauling of power units is simplified for the service staff of an operating company. It seems worth while to emphasise one point which the aeroplane operator realises only too well, that *maintenance costs money*, and that a minimum of maintenance requirements is a very desirable feature that must not be lost sight of in design. These are some of the main reasons for leading one to believe that an air-cooled engine is essential.

In Appendix I are given, briefly, the technical details that the inquiring reader can study at his lesisure.

Performance.—In Fig. IV is given the performance of the aircraft as calculated from the data of Appendix I. The reader is referred to this appendix for further information concerning the run to take off and run in landing, with and without brakes, and for information concerning the R.P.M. of the engine and the petrol consumption. To make the article concise the working out has been omitted, but the method adopted is similar to that so fully described in FLIGHT for the long-range Avian.[7]

Means of Improving the Performance.—Probably one of the first facts forced upon one's notice is the demands that high speed entail upon power. It is well known, of course, that the power goes up approximately as the cube of the speed for the same aircraft. Thus, if the cruising speed of a commercial aeroplane were required to be increased from, say, 100 m.p.h. to 150 m.p.h., the engine power would need increasing by $(150/100)^3 = 3{\cdot}38$, and as about two-thirds of the maximum power is absorbed in cruising speed, the B.H.P. of the engine would need to be $0{\cdot}67 \times 3{\cdot}38 = 2{\cdot}25$ times the original B.H.P. One is led, therefore, to ask: Is it not possible to find some means of effecting economies in the design of the aircraft which will counteract this cube law? The following ways immediately seem to suggest themselves:—

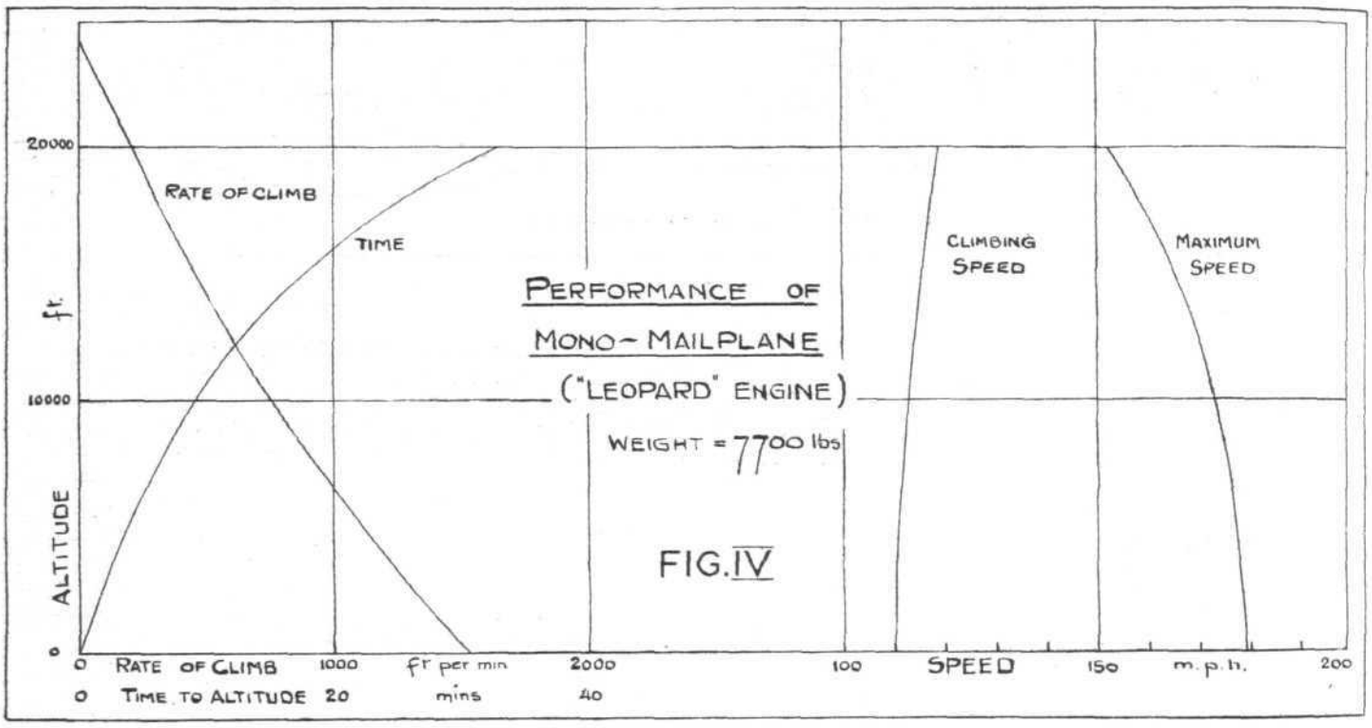
(1) Cleaning up the aircraft as much as possible and reducing the wing area to a minimum compatible with safety and using a specially shaped engine.

(2) Retracting the undercarriage within the wings or the body to reduce the drag under cruising conditions.

(3) Improving the disposable load as a percentage of the all-up weight.

(4) By using a supercharged engine and cruising at higher altitudes than with the normal aspirated engine.

(1) On the assumption that first-class pilots only will be employed for air mail work, and provided the risks arising from forced landings can be suitably diminished, it would appear feasible to permit an increase in the landing speed from 60 m.p.h. to 70 m.p.h. without unduly jeopardising the pilot's safety. Investigations were made on this basis, and the top speed was found to be increased by 8-9 m.p.h.



(2) In order to retract the undercarriage, the arrangement of the aircraft would need certain modifications. The wings would need to be thickened at the roots and a low wing position would be necessary. (The scheme will be indicated in the next article.) There would be a certain amount of extra weight entailed in the retracting mechanism. Investigations lead one to expect an increase in the top speed by this means alone of 8 to 9 m.p.h.

(3) If by any radical departure from conventional metal construction the percentage disposable load could be increased by 10 per cent. or more, we should have a means of making postal work much more profitable, for in the mail-plane under consideration this advantage alone would increase the mail load from 1,000 lb. to 1,770 lb., which is a very appreciable amount. One method of increasing the pay load by such an amount is claimed by the Monospar method of wing construction, and, assuming that their claims can be substantiated, the mailplane designer has a very useful means of making postal work more profitable to the operator.

(4) The effect of a supercharged engine would be to increase the cruising speed of the aircraft, assuming supercharging was to 10,000 ft., from 150 m.p.h. to something of the order of 168 m.p.h., and would also allow the pilot to fly above most fogs, as their upper limit does not often exceed 1,000 ft. With the single engine there is the further advantage that the pilot has a longer time in which to think and choose his emergency landing ground.

A fuller consideration of these above-mentioned aids to postal transport economy will be given in the next article.

(To be continued.)

[Appendix I will be found on p. 84.—ED.]

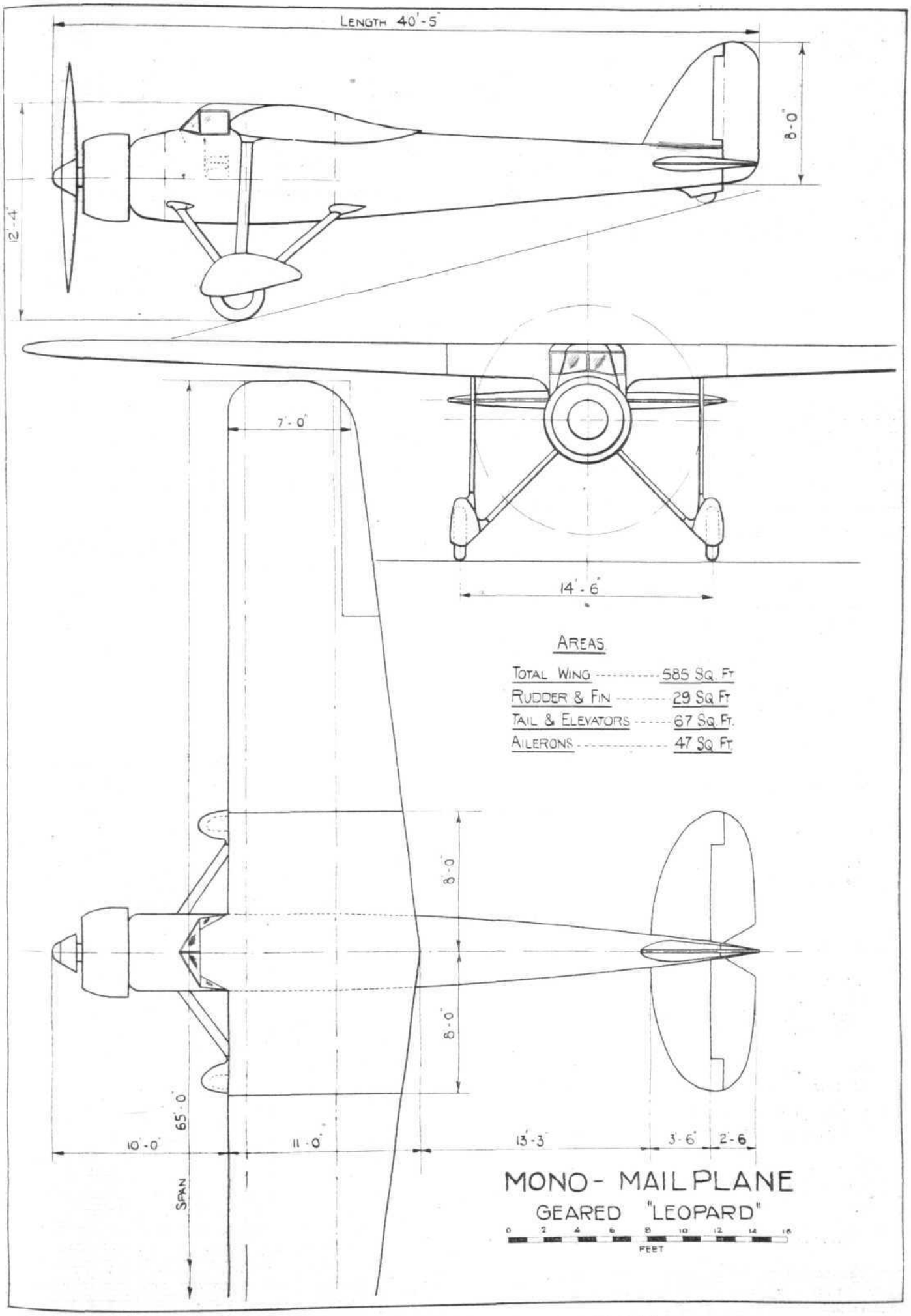


Fig 3.—Design for single-engined mailplane, by Frank Radcliffe.

APPENDIX I

Sundry data.

Maximum all-up weight of aircraft (W)	=	7,700 lb.
Normal B.H.P. at 1,700 r.p.m. for Leopard (P)	=	813 h.p.
Area of wings (S)	=	585 sq. ft.
Aspect ratio of wings	=	7·32
Semi span of wings (s)	=	32·5 ft.
Mean chord of wings (c)	=	9 ft.
Airscrew diameter	=	13 ft.
Distance from C.G. to sternpost (l)	=	26 ft.
Area of fin and rudder S_R	=	29 sq. ft.
Area of tail and elevators S_T	=	67 sq. ft.

$\frac{W}{S} = 9{\cdot}45$; $\frac{W}{S} = 13{\cdot}16$; $\frac{P}{S} = 1{\cdot}39$

Rudder volume $= \frac{S_R \times l}{S \times s} = 0{\cdot}04$

Tail volume $= \frac{S_T \times l}{S \times c} = 0{\cdot}33$

The wing section chosen for all-round efficiency is N.A.C.A.—M.6.[8]. This has been thickened up at the root to 18 per cent., and the extra profile drag, estimated on the basis of N.A.C.A. Rep. 312[9], has been assessed at 0·0008. A correction has been made for incidence, on the fuselage drag by means of N.A.C.A. Rep. 236 [10].

The body is arranged to offer minimum drag at 150 m.p.h. and this gives a wing setting relative to the body of 3°. The parasitic drag has been estimated and is as follows :—

Parasitic drag at 100 *f.p.s.*

	lb.
Body, complete with engine, Townend ring and cabin	60·5
Faired wheels	14·0
Struts	8·2
Tail unit	18·2
Tail wheel	3·0
Free air drag	103·9
15 per cent. added for interference	15·6
Total parasitic drag	119·5

Amount in slip stream = 38 per cent.
$k_R = 0{\cdot}0086$

Weight estimate.

	lb.	
Wings at 2·05 lb. per sq. ft.	1,200	Structure
Fuselage, complete	850	= 2,574 lb.
Undercarriage and tail wheel	360	= 33·5 per cent.
Tail unit	130	—
Controls	34	—
Leopard engine	1,650	Power plant
Ring	60	= 1,969 lb.
Tanks (part acting as wing covering)	160	= 25·6 per cent.
Piping	15	—
Airscrew	84	—
Useful load, made up of 1,000 lb. of mails, crew of 2, W/T, etc.	1,620	Disposable Load
Fuel (186 gallons)	1,410	= 3,144 lb.
Oil (12 gallons)	114	= 40·9 per cent.
Total all-up weight	7,687 lb.	100 per cent.

Weight, considered in calculations = 7,700 lb.

For the *landing speed*, it is reasonable to assume that k_L for the whole aircraft = 0·75

∴ landing speed, full tanks = 59 m.p.h.
and landing speed, empty tanks = 52 m.p.h.

Performance

Altitude ft.	Max. speed. m.p.h.	Max. rate of climb. ft. per min.	Time to altitude. min.
G.L.	179	1,525	—
5,000	177	1,110	3·8
10,000	173	750	9·3
15,000	165	460	17·7
20,000	152	220	33·3

Service ceiling = 22,200 ft.

Run to get off in a calm and climb to 66 ft. = 644 yd.

Landing run in a calm :

(*a*) With no brakes ($\mu = 0{\cdot}05$)	= 552 yd.
(*b*) With wheel brakes ($\mu = 0{\cdot}25$)	= 241 yd.
(*c*) With wheel brakes ($\mu = 0{\cdot}25$) and air brakes, to increase aerodynamic drag by 20 per cent.	= 224 yd.

Cruising particulars :

	at 150 miles per hour	at 140 miles per hour.
Miles per gallon	= 3·9	= 4·43
Petrol consumed for 750 miles	= 184 gals.	= 169 gals.
Time for 750 miles	= 5 hr.	= 5·35 hr.
R.P.M. of engine	= 1,550	= 1,470

N.B.—It has been assumed that the airscrew is designed to give maximum efficiency at 150 m.p.h.

References.

[7] *Vide* FLIGHT, November 7, 1930. The Long Range Avian pp. 1214-1217.

[8] N.A.C.A. Report 260.—Effect of flaps and aileron on M.6.

[9] N.A.C.A. Report 312.—Prediction of Airfoil characteristics.

[10] N.A.C.A. Report 236.—Tests on Airplane floats and hulls.

METHOD OF STRESSING DIVIDED UNDERCARRIAGES.

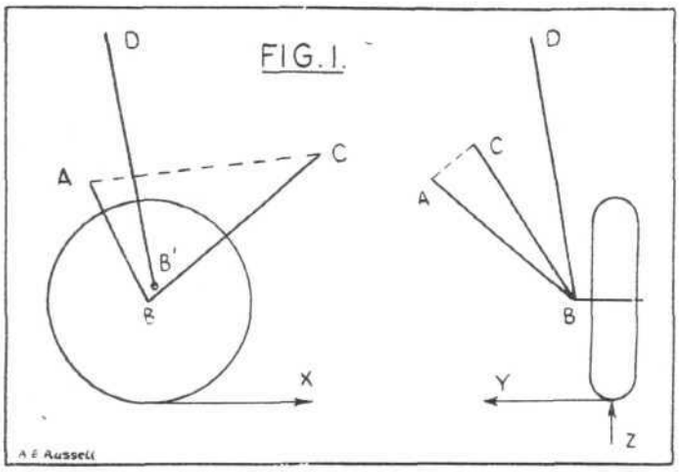
BY A. E. RUSSELL, B.Sc., A.F.R.Ae.S.

In pre-brake days approximations or guesses could be resorted to in the design of the axle and radius rod of an aeroplane undercarriage, but with a large braking torque introduced, a method approaching actual conditions becomes necessary to give the confidence desired in a design. For quite a long time there was no standard method in use, and the problem was treated by approximate methods. Mr. A. E. Russell, who is in charge of the Stress Department of the Bristol Aeroplane Co., Ltd., has worked out the method which he explains in the following article, and this method has now, we understand, been approved by the Airworthiness Department. It may be recollected that in our issues of November 29, 1929, *December* 27, 1929, *and January* 31, 1930, *was published an article on "Load Factors" by Mr. Russell, who is thus no newcomer to the pages of* THE AIRCRAFT ENGINEER.

The structural strength of the ordinary "straight axle" type of undercarriage may be estimated with the use of elementary statics. The axle can balance by a simple bending moment any couple about the x or z axes of the machine, a couple about the y axis (*e.g.*, braking torque) may be balanced by a bending moment in the radius rod. When the wheels are not connected together by a common straight axle, but are independently mounted, a rather more complex problem is encountered. Each wheel rotates about the line joining the connection of its axle and radius rod to the rigid structure; this hinge line may not be in any of the principal axes of the machine. The radius rod may now take bending moments under any system of loading, and torsion may be introduced into the axle or radius rod, or both. The proportion of the bending moment and torsion

taken by the axle and radius rod depends on their relative stiffness and type of fixation, one with the other, and with the rigid structure.

Dealing with the problem in as general a manner as possible, assume the undercarriage to be stressed by a combination of the following loads at the tyre centre: (*a*) an up load perpendicular to the ground; (*b*) a backwards load parallel to the ground; and (*c*) a side load perpendicular to the plane containing (*a*) and (*b*). In each of the different cases considered for stressing, the appropriate loads at the tyre centre are resolved into the axes of the machine.



General Layout of Structure (Fig. 1) :—

AB is the axle. BC in the radius rod. DB is the oleo leg.

The oleo leg may be offset in side elevation to partly balance brake torque.

AC is the hinge line about which B rotates.
Loads to be considered (in axes of machine).
X Backwards at tyre centre.
Y inwards at tyre centre.
Z Upwards at tyre centre.
If in opposite direction consider negative.

These loads may be replaced by parallel forces X, Y and Z acting at B plus couples Cx, Cy, Cz about the x, y and z axes respectively.

Let $l_1 m_1 n_1$ be the direction cosines of the oleo leg.
$l_2 m_2 n_2$,, ,, ,, ,, radius rod.
$l_3 m_3 n_3$,, ,, ,, ,, axle.
$l_4 m_4 n_4$,, ,, ,, ,, hinge line.

Let P_O be the end load in the oleo leg.
P_R ,, ,, ,, radius rod.
P_A ,, ,, ,, axle.
M_A ,, bending moment in the axle at B.
M_R ,, ,, ,, ,, radius rod at B.
T_A ,, Torsion in the axle.
T_R ,, ,, ,, radius rod.

With B as origin and axes parallel to the axes of machine, the resultant load of X, Y and Z may be represented by the vector given by the equation

$$\frac{x}{l_r} = \frac{y}{m_r} = \frac{z}{n_r} \text{ and of magnitude R} \quad \ldots\ldots\ldots\ldots (1)$$

$$R = \sqrt{X^2 + Y^2 + Z^2}$$
$$l_r = X/R.$$
$$m_r = Y/R.$$
$$n_r = Z/R.$$

Similarly, the resultant couple C may be represented by the vector given by the equation

$$\frac{x}{l_c} = \frac{y}{m_c} = \frac{z}{n_c} \text{ and of magnitude } c \quad \ldots\ldots\ldots\ldots (2)$$

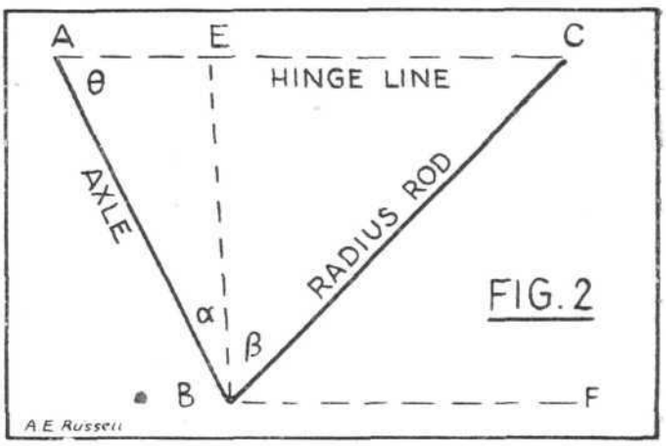
$$c = \sqrt{Cx^2 + Cy^2 + Cz^2}$$
$$l_c = Cx/C.$$
$$m_c = Cy/C.$$
$$n_c = Cz/C.$$

If α, β, γ, be the co-ordinates of the top axle joint, the equation to the line A C is

$$\frac{x-\alpha}{l_4} = \frac{y-\beta}{m_4} = \frac{z-\gamma}{n_4} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

If θ is the angle between the hinge line and the axle

$$\text{Cos } \theta = l_3 l_4 + m_3 m_4 + n_3 n_4$$



The above diagram (Fig. 2) may be drawn to scale.
The position of E is given by the calculated length of AE.

$$AE = AB \cos \theta$$
$$= L_3(l_3 l_4 + m_3 m_4 + n_3 n_4)$$

Whence the co-ordinate of E may be found from the known co-ordinates of A and C and the ratio $AE/AC = AE/L_4$.

The direction cosines of BE. $l_5 m_5 n_5$ may now be found and its equation will be

$$\frac{x}{l_5} = \frac{y}{m_5} = \frac{z}{n_5} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The angles between the Force vector and AC and BE are

$\cos^{-1}(l_r l_4 + m_r m_4 + n_r n_4)$

$\cos^{-1}(l_r l_5 + m_r m_5 + n_r n_5)$ respectively.

Hence the components along these axes are

R $(l_r l_4 + m_r m_4 + n_r n_4)$
and R $(l_r l_5 + m_r m_5 + n_r n_5)$.

The component perpendicular to this plane ABC may be found by the difference in squares.

Similarly, the couples about AC and BE are

C $(l_c l_4 + m_c m_4 + n_c n_4)$
and C $(l_c l_5 + m_c m_5 + n_c n_5)$

and the couple about the perpendicular axis may again be found by the difference in squares.

The angles α and β may be measured or calculated.

Having thus resolved the couples and loads into the plane ABC, we will consider how they will be balanced by the structure. Referring to Fig. 2 :—

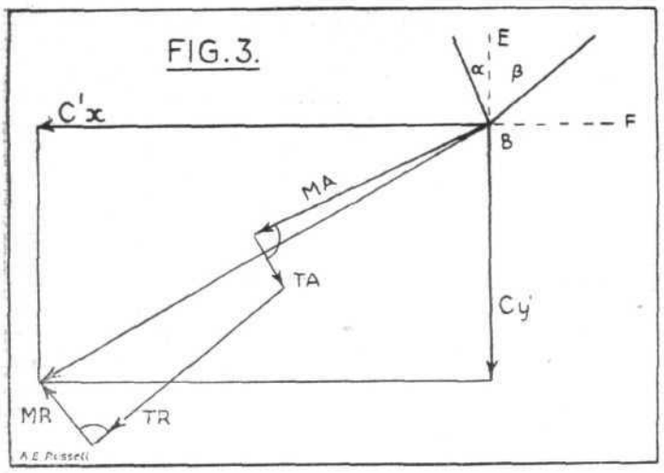
Let $C'x$ be the couple parallel to BF
$C'y$,, ,, ,, BE
$C'z$,, ,, perpendicular to ABC
$R'x$,, load parallel to BF
$R'y$,, ,, ,, BE
$R'z$,, ,, perpendicular to ABC

The balance of couples may be shown most conveniently by a vector diagram. Remembering that a couple or moment vector is represented by a line along the axis of the couple, and direction such that a clockwise rotation produces a forward motion.

The resultant couple of the bending moments and torsions of the axle and radius rod must balance the resultant of $C'x$ and $C'y$.

Two equations may be found by resolving along $C'x$ and $C'y$ (Fig. 3); taking positive couples as shown by the arrows.

$$M_A \cos\alpha - T_A \sin\alpha + T_R \sin\beta + M_R \cos\beta = C'x \quad (5$$
$$M_A \sin\alpha + T_A \cos\alpha + T_R \cos\beta - M_R \sin\beta = C'y \quad (6$$

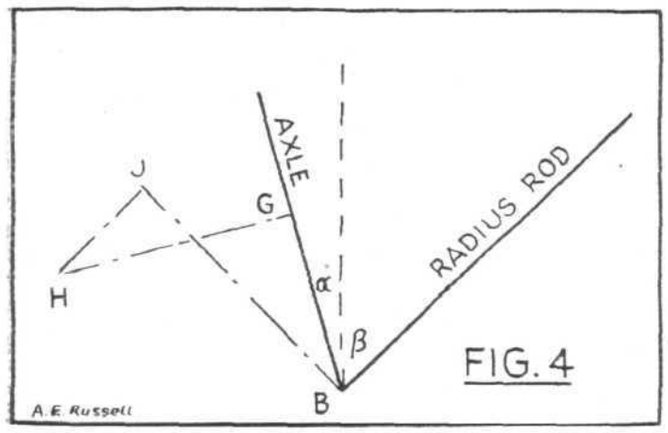


Now let θ_A be the angle of slope of the axle due to the bending moment in the axle and θ_R be the angle of slope of the radius rod due to the bending moment in the radius rod.

Also let ϕ_A be the angle of twist of the axle due to the torsion in the axle and ϕ_R be the angle of twist of the radius rod due to the torsion in the radius rod.

Referring to Fig. 4.

Consider a normal to the plane containing the axle and radius rod at B. The change of position of a point Q on



it, at unit distance from B, will be sin θ_A along the axle and sin ϕ_A perpendicular to it, *i.e.*, Q moves along the axle to G and thence to H, where BG and GH are proportional to sin θ_A and sin ϕ_A respectively. If the axle and radius rod are rigidly attached at B, the point Q moving parallel and perpendicular to the radius rod due to θ_R and ϕ_R must reach the same point H, therefore HJ and JB must be proportional to sin θ_R and sin ϕ_R.

Resolving along and perpendicular to the axle, this gives two more equations

$$\begin{aligned}\text{Sin } \theta_A &= \sin \phi_R \cos(90 - \overline{\alpha + \beta}) + \sin \theta_R \sin(90 - \overline{\alpha+\beta}) \\ &= \sin \phi_R \sin(\alpha + \beta) + \sin \theta_R \cos(\alpha + \beta) \quad \ldots\ldots(7)\end{aligned}$$

$$\begin{aligned}\text{and } \sin \phi_A &= \sin \phi_R \sin(90 - \overline{\alpha + \beta}) - \sin \theta_R \cos(90 - \overline{\alpha+\beta}) \\ &= \sin \phi_R \cos(\alpha + \beta) - \sin \theta_R \sin(\alpha + \beta) \quad \ldots.(8)\end{aligned}$$

At this stage we will examine how modifications to the design will alter the method.

Still assuming that the fittings at the top end of the axle and radius rod are capable of taking torsion.

(A) If the radius rod fitting may rotate round the axle and the brake is not connected to the axle T_A will equal 0. Use equations (5), (6) and (7) for solving $M_A M_R$ and T_R.

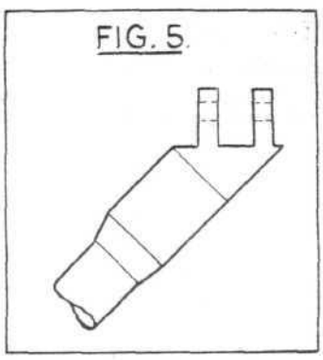
(B) If the radius rod has only one pin, perpendicular to itself and in the plane of the axle and radius rod, it will not take bending moment, *i.e.*, $M_R = 0$. Instead of resolving along the axle as in Fig. 3 to get equations (7) and (8) resolved perpendicular to the radius rod. The components of sin θ_A and sin ϕ_A equal sin ϕ_R. This equation with equations (5) and (6) give the solution.

The fittings at the top end also modify the method and the following alternatives might occur.

(C) If both fittings are ball joints put T_A and $T_R = 0$ in equations (5) and (6).

(D) If the radius rod fitting is a ball joint put $T_A = 0$ in equations (5) and (6) and use a third equation appropriate to the type of fitting at B.

(E) The fittings may have one pin along the hinge line. This case will be explained in some detail.



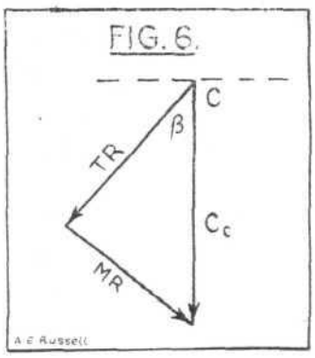


Fig. 5 explains the type in question. Fig. 6 shows the vector forces in a radius rod as required to give balance.

If we assume this fitting to be a pin-joint, the bending moment at C is zero. This, however, is not the case. The torsion vector T_R in Fig. 6 has a component perpendicular and parallel to the hinge line, *i.e.*, there is a turning moment about the hinge. Suppose there to be a bending moment at C, it also will have a component perpendicular and parallel to the hinge line. For static balance these two turning moments must balance. Representing this diagrammatically the resultant couple vector at C must be perpendicular to the hinge line. From the known value of T_R the bending moment is found. This large resultant couple C must be balanced by bending moments in the undercarriage mounting structure and is a great disadvantage of this type of fitting.

Referring to Fig. 6

$$M'_R = T_R \tan \beta$$

and the resultant couple C

$$\begin{aligned}C &= T_R \cos \beta + M'_R \sin \beta \\ &= T_R \left(\cos \beta + \frac{\sin}{\cos} \beta\right) \\ &= T_R \sec \beta\end{aligned}$$

(F) Similar conditions exist when the top joint of axle or radius rod is a universal. This type of joint will only transmit a couple along an axis perpendicular to the two pins. If this axis does not lie in the plane of the axle and radius rod, not only must there be a bending moment vector in this plane but also along a normal to the plane.

For a general solution, let the axis of this couple be

$$\frac{x}{l'} = \frac{y}{m'} = \frac{z}{n'}$$

This must be resolved into the plane ABC along and perpendicular to the axle and also along a normal to the plane.

The equation to the plane ABC may be written

$$Lx + My + Nz = 0,$$

and from conditions of perpendicularity

$$Ll_3 + Mm_3 + Nn_3 = 0,$$

$$\text{and} \quad Ll_4 + Mm_4 + Nn_4 = 0.$$

Expressing as a determinate

$$\begin{vmatrix} x & y & z \\ l_3 & m_3 & n_3 \\ l_4 & m_4 & n_4 \end{vmatrix} = 0$$

whence L, M and N are found.

The direction cosines of a normal to this plane are

$$\frac{L}{\sqrt{L^2 + M^2 + N^2}} \quad \frac{M}{\sqrt{L^2 + M^2 + N^2}} \quad \frac{N}{\sqrt{L^2 + M^2 + N^2}}$$

The angles between the couple axis and the member and the couple axis and the normal enable the two bending

moments and the couple transmitted to be found in terms of the torsion in the member.

The components of the oleo leg in the plane ABC will now be found.

The component parallel to the hinge line AC is

$$Po\,(l_1l_4 + m_1m_4 + n_1n_4)$$

and the component parallel to BE is

$$Po\,(l_1l_5 + m_1m_5 + n_1n_5).$$

The component perpendicular to the plane ABC may be found by the difference in squares.

If there are any offsets at the foot of the oleo, the direction cosines should now be corrected for these.

If M'_A and M'_R are the bending moments at the top joints of the axle and radius rod respectively, the load in the oleo is given by

$$Po = \frac{R'z + \frac{M_A - M'_A}{L_3} + \frac{M_R - M'_R}{L_2}}{\sqrt{l - (l_1l_4 + m_1m_4 + n_1n_4)^2 - (l_1l_5 + m_1m_5 + n_1n_5)^2}}$$

If the oleo is offset δ along BF, the nett couple about the y axis is

$$C'y_{nett} = C'y - \delta\left(R'z + \frac{M_A - M'_A}{L_3} + \frac{M_R - M'_R}{L_2}\right)$$

and the nett couple about the z axis is

$$C'z_{nett} = C'z - Po\,(l_1l_5 + m_1m_5 + n_1n_5)\,x\,\delta$$

Since the load in the oleo leg is influenced by the bending moments in the axle and radius rod, a further unknown is introduced requiring another equation for the solution.

The following five equations are a general solution for any type of divided undercarriage.

(A) $\cdot \sin\theta_A = \sin\phi_R \sin(\alpha+\beta) + \sin\theta_R \cos(\alpha+\beta)$

(B) $\cdot \sin\phi_A = \sin\phi_R \cos(\alpha+\beta) - \sin\theta_R \sin(\alpha+\beta)$

C) $\cdot M_A\cos\alpha - T_A\sin\alpha + T_R\sin\beta + M_R\cos\beta = C'x$

(D) $\cdot M_A\sin\alpha + T_A\cos\alpha + T_R\cos\beta - M_R\sin\beta =$

$$C'y - \delta\left(R'z + \frac{M_A - M'_A}{L_3} + \frac{M_R - M'_R}{L_2}\right)$$

(E) $\cdot Po\sqrt{l - (l_1l_4 + m_1m_4 + n_1n_4)^2 - (l_1l_5 + m_1m_5 + n_1n_5)^2}$

$$= R'z + \frac{M_A - M'_A}{L_3} + \frac{M_R - M'_R}{L_2}$$

The bending moments in a plane perpendicular to these are found by equating the slopes at B in the plane ABC due to the bending moments M'_A and M'_R

$$M'_A + M'_R = C'z - Po\,(l_1l_5 + m_1m_5 + n_1n_5)\,X\,\delta$$

If there is only one vertical pin at B the axle takes the whole bending moment.

1. *To express sin* ϕ in terms of T.

This angle will be small $\therefore \sin\phi = \phi$ radians approx.

$$\phi \text{ rads} = \frac{T\cdot l}{N\cdot J}$$

For a round tube

$$\phi \text{ rads} = \frac{T\cdot l}{2N\,I} = \frac{30}{12} \times \frac{T\cdot l}{2\,EI} = 1{\cdot}25\ \frac{T\cdot l}{E\,I}$$

2. *To express sin* θ *in terms of* $(M - M')$.

This angle is also small $\therefore \sin A = \tan A$ approx. $= dy/dx$.

Suppose a beam to be loaded as shown in Fig. 7,

(a) Under a tension P

$$-E\cdot I\ d^2y/dx^2 = Wx - Py + M'$$

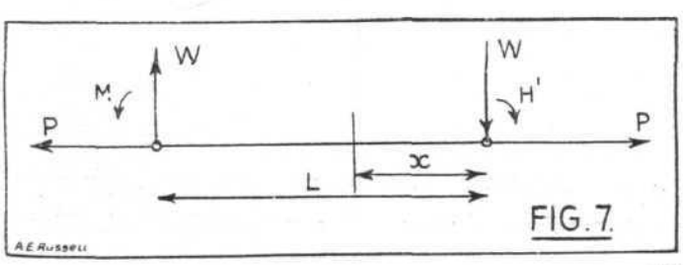


FIG. 7.

and the solution to this equation is

$$y = A\sinh\mu x + B\cosh\mu x + \frac{Wx}{P} + \frac{M'}{P}$$

when $x = 0$, $y = 0$; and when $x = L$, $y = 0$:

$$0 = B + \frac{M'}{P} \quad B = -M'/P$$

$$\text{and } 0 = A\sinh\mu L - \frac{M'}{P}\cosh\mu L + \frac{WL}{P} + \frac{M'}{P}$$

$$A = \frac{M'}{P}\coth\mu L - \frac{M}{P}\frac{1}{\sinh\mu L}$$

$$y = \frac{\sin\mu x\, M'\coth\mu L}{P} - \frac{\sinh\mu x\, M}{P\sinh\mu L} - \frac{M'}{P}\cosh\mu x + \frac{Wx}{P} + \frac{M'}{P}$$

$$\frac{dy}{dx} = \frac{\mu\cosh\mu x M'\coth\mu L}{P} - \frac{\mu\cosh\mu x M}{P\sinh\mu L} - \frac{\mu M'}{P}\sinh\mu x + \frac{W}{P}$$

when $x = L$

$$\frac{dy}{dx} = \frac{M'}{P}\mu\cosh\mu L\coth\mu L - \frac{L - M\mu}{P}\coth\mu L - \frac{\mu M'}{P}\sinh\mu L + \frac{W}{P}$$

$$= \frac{\mu M'}{P}\left(\frac{\cosh^2\mu L - \sinh^2\mu L}{\sinh\mu L}\right) - \frac{\mu M}{P}\coth\mu L + \frac{W}{P}$$

$$= \frac{\mu M'}{P}\cdot\frac{1}{\sinh\mu L} - \frac{\mu M}{P}\cdot\coth\mu L + \frac{W}{P}$$

If the member is under a compression P

$$y = A,\sin\mu x + B,\cos\mu x - \frac{Wx}{P} - \frac{M'}{P}$$

when $x = 0$, $y = 0$; and when $x = L$, $z = 0$

$$0 = B_1\cos\mu - \frac{M'}{P} \therefore B_1 = \frac{M'}{P}$$

$$\text{and } 0 = A_1\sin\mu L + \frac{M'}{P}\cos\mu L - \frac{WL}{P} - \frac{M'}{P}$$

$$A_1 = -\frac{M'}{P}\cot\mu L + \frac{M}{P}\frac{1}{\sin\mu L}$$

$$y = -\frac{M'}{P}\sin\mu x\cot\mu L + \frac{M}{P}\frac{\sin\mu x}{\sin\mu L} + \frac{M'}{P}\cos\mu x - \frac{Wx}{P} - \frac{M'}{P}$$

$$\frac{dy}{dx} = -\frac{M'}{P}\mu\cos\mu x\cot\mu L + \frac{M}{P}\frac{\mu\cos\mu x}{\sin\mu L} - \mu\frac{M'}{P}\sin\mu x - \frac{Wx}{P}$$

when $x = L$

$$\frac{dy}{dx} = -\frac{M'}{P}\frac{1}{\sin\mu L} + \frac{\mu M}{P}\cot\mu L - \frac{W}{P}$$

When the end load is small and may be neglected

$$-EI\ d^2y/dx^2 = Wx + M'$$

$$-EI\ dy/dx = \frac{Wx^2}{2} + M'x + A$$

$$-EI\ y = \frac{Wx^3}{6} + \frac{M'x^2}{2} + Ax + B$$

when $x = 0$, $y = 0$; when $x = L$, $y = 0$:

$$0 = B$$

$$0 = \frac{WL}{6} + \frac{M'L}{2} + AL$$

$$A = -\frac{L}{6}(WL + 3M') = -\frac{L}{6}(M + 2M')$$

when $x = L$

$$-EI\,dy/dx = \frac{WL^2}{2} + M'L - \frac{L}{6}(M + 2M')$$

$$= \frac{L}{6}(3WL + 6M') - \frac{L}{6}(M + 2M')$$

$$= \frac{L}{6}(3M + 3M' - M - 2M')$$

$$dy/dx = -\frac{L}{6EI}(2M + M')$$

A difficulty arises in the calculations. For an exact solution, the end loads must be known before the slopes may be found. There are two alternatives. Either the torsion in the members must first be neglected to obtain approximate end loads which may then be used to give the values of the slopes in terms of the bending moments, or the effect of end load on the slopes must be neglected. The better assumption depends on the geometry of the undercarriage.

(To be concluded.)

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any bookseller.

ON THE PROBLEM OF HYDRODYNAMIC STABILITY.—I. UNIFORM SHEARING MOTION IN A VISCOUS FLUID. By R. V. Southwell, F.R.S., and Letitia Chitty. R. & M. No. 1200. (Ae. 361). (54 pages and 17 diagrams.) January, 1930. Price 2s. 6d. net.

The report lays down the following as the only known cases where the stability of the steady motion of fluids has been demonstrated.

(*a*) The laminar flow of a fluid, under uniform pressure gradient or body forces, between two fixed parallel planes (Lamb, "Hydrodynamics," § 330).

(*b*) The laminar flow of a fluid between two plane and parallel boundaries which have a uniform velocity relative to one another in a direction parallel to their planes (*ibid.*, § 330 (*a*).)

(*c*) The rectilinear flow of a fluid, under uniform pressure or body forces, rough a straight pipe of uniform section (*ibid.*, §§ 331, 332).

(*d*) Two-dimensional rotatory motion of fluid about a fixed axis, between two co-axial cylinders of infinite length (*ibid*, § 333).

This report describes work which has been done in an attempt to examine the stability of the motion (*b*). The aim has been to develop a generalised theory of the kind which Rayleigh employed so successfully in relation to problems of vibration, *whereby the critical velocity of steady flow might be estimated approximately in cases where exact solutions are unobtainable.* Attention is confined to disturbances which are two-dimensional..

Section III of the report describes the "Method of Normal Co-ordinates which entails a study of disturbances varying according to a simple exponential factor of the time. It is shown that the method may be used to obtain a complete solution (for infinitesimal disturbances) in the special case of the problem. where the plane boundaries are at rest. The method is then applied to the general case (with moving boundaries); it is found to break down on account of the failure. in this case, of certain "conjugate relations" which are an essential basis of the method in its existing form.

Other lines of attack on the problem are discussed and are being continued.

EXPERIMENTS ON THE IGNITION OF GASES BY SUDDEN COMPRESSION. By R. W. Fenning, M.B.E., B.Sc., D.I.C. and F. T. Cotton, B.Sc. Work performed for the Department of Scientific and Industrial Research. R. & M. No. 1324. (E. 36). (43 pages and 18 diagrams). November, 1929. Price 2s. 6d. net.

Whilst experimenting at Cambridge on the ignition temperatures of air-gas mixtures having high ignition temperatures, Messrs. Tizard and Pye obtained results which were somewhat erratic. Subsequently, the compression ignition apparatus was sent to the National Physical Laboratory, in order that this anomalous behaviour might be investigated.

(*a*) Experiments on air-hydrogen, air-acetylene, air-benzene, and air-hexane mixtures were carried out, using the apparatus as received, and discordant results obtained despite the efforts made to secure constancy of conditions.

(*b*) The apparatus was modified so as to eliminate friction effects and be able to study the influence of (i) surface friction, (ii) the presence of lubricating oil, and (iii) fine metallic particles in suspension; all at room temperature (initially).

(*c*) The experiments under (*b*) indicated that consistent results should be obtainable in a well-lubricated cylinder at room temperature, and this form of apparatus was used for subsequent work (on air-methane mixtures).

There is strong evidence in favour of the highest values given by the apparatus, as received and *as operated*, approaching the most closely to the true values of the ignition temperature.

The values of the ignition temperature, under the cooling conditions pertaining to these particular bulb experiments, are of the order:—

7·6 per cent. acetylene, 92·4 per cent. air	440° C.
8·9 per cent. methane, 91·1 per cent. air	620° C.
29·1 per cent. hydrogen, 70·9 per cent. air.. ..	670° C.

An increase in the "gas" concentration tends to lower the ignition temperature.

Compressions in a cylinder (at room temperature) by means of a piston flooded with castor oil, appear to give consistent results.

Incidentally, the influence of particles of cotton wool in the mixture was examined and their presence was found to result in a substantial lowering of the ignition temperature. This is possibly of some significance in connection with investigations relating to explosions in mines.

PERFORMANCE OF A COMPRESSION IGNITION UNIT WITH REDUCED INTAKE AND EXHAUST PRESSURES. By P. H. Stokes, B.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1328. (E. 38.) (20 pages and 21 diagrams.) December, 1929. Price 1s. 6d. net.

Tests were carried out on the R.A.E.20.T. compression ignition unit in order to determine the rate of fall off in power with reduced intake and exhaust pressures, the rate of increase of power with boost and the change in power and thermal efficiency with change of excess air at reduced pressures.

When the maximum cylinder pressure was maintained by increasing the injection advance at reduced pressures, the indicated horse-power decreased in direct proportion to the decrease in absolute pressure, when maintaining 30 per cent. excess air. The fuel consumption per B.H.P.-hours remained constant, while on an I.H.P. basis it decreased slightly with decrease in pressure. Mechanical losses decreased with decrease in intake and exhaust pressure owing to the reduced pumping and frictional losses. When a fixed fuel injection timing was employed, the maximum cylinder pressure dropped from 800 to 450 lb./sq. in., as the absolute intake and exhaust pressure was decreased from 28 to 20 in. Hg. Over this pressure range there was an additional 8·5 per cent. decrease in B.H.P., compared with the constant maximum cylinder pressure tests.

The rate of decrease of fuel consumption with the increase in excess air coefficient was found to be more rapid at the lower absolute pressures. The amount of fuel injection advance necessary to maintain constant maximum cylinder pressure at reduced loads increased more rapidly as the air density decreases, thus an unsupercharged compression ignition engine at altitude would require a wider range of fuel injection advance than was apparent from ground level conditions. The tests with varying excess air coefficient and constant fuel injection timing, when compared with the preceding tests, demonstrated the advantages, especially in fuel economy, to be obtained by advancing the time of fuel injection.

When increasing the intake pressure above that of the exhaust, the increase in power was 37 per cent. for a 40 per cent. increase in intake pressure, maintaining 30 per cent. excess air.

COMPARATIVE HANDLING TESTS OF THREE BRISTOL FIGHTER AIRCRAFT WITH DIFFERENT TYPES OF SLOTS. By Flight-Lieut. C. E. Maitland, D.F.C., and Flight-Lieut. J. H. C. Wake. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1332. (Ae. 464). (8 pages and 9 diagrams.) October, 1929. Price 9d. net.

Comparative handling trials were required on three types of slot, namely—Coupled control slot, auto control slot, and coupled pilot slots. Accordingly, tests were carried out in normal and in stalled flight, and the effect of the three types of control on recovery from prolonged spins was also investigated.

The centres of gravity of the aircraft for most of the tests were 14·4 in. behind the leading edges of the lower main planes, that is approximately on the aft Air Ministry limit.

The general conclusion is that the coupled control slot is considered to be the better device all round, except perhaps for checking a prolonged spin.

PHOTOGRAPHIC RECORDS OF FLOW IN THE BOUNDARY LAYER. By L. F. G. Simmons, M.A., A.R.C.Sc., and N. S. Dewey, M.A. R. & M. No. 1335. (Ae. 466.) (9 pages and 13 diagrams.) May, 1930. Price 1s. net.

The experiments here described form a continuation of the earlier investigation of R. & M. 1334, undertaken with the object of developing methods of photographing airflow in the boundary layer.

Various means for indicating airflow were examined, including the vapour of volatile liquids, smoke formed through chemical combination of two different vapours, and smoke produced by the chemical action of a vapour in the presence of moist air. To compare the merits of the optical system of R. & M. 1334 and the "Schlieren" method, a series of photographs of turbulent flow were taken with the different indicators used to reveal the structure. Some attempts were also made to devise a simple method for indicating the region of turbulence in the boundary, but these led to negative results.

The investigation clearly demonstrated the superiority of titanium tetrachloride over other methods as a means for revealing airflow. A typical set of photographs of turbulent flow taken over a range of wind speeds up to 50 ft. per second is appended to the report.

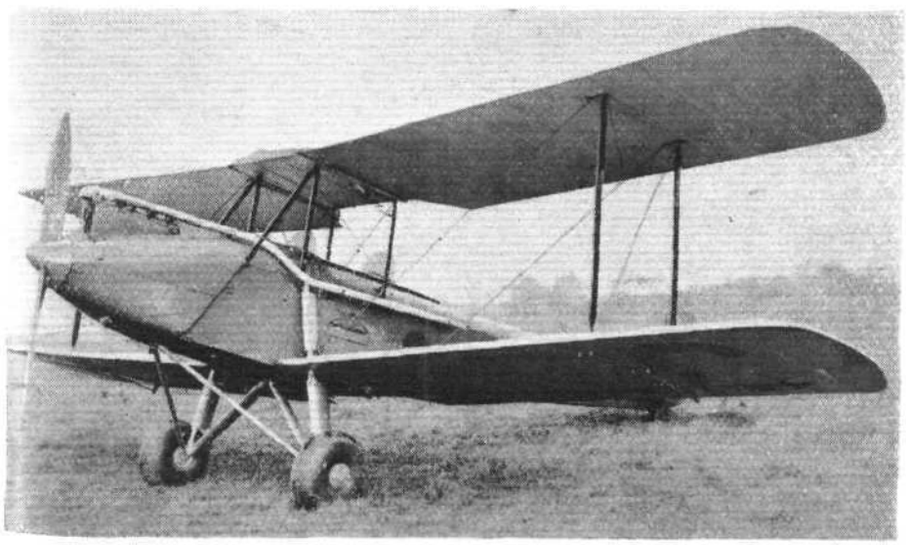
PRIVATE FLYING AND CLUB NEWS

AVIAN DEVELOPMENTS.—Henleys, who are the marketing agents for Avro-Avians, have just announced the new range of prices which will be in force for 1931. These comprise the wooden Avian with semi-balloon tyres, compass, two air-speed indicators, two sets of engine switches, cockpit and engine covers, dual control and split-axle undercarriage: with Gipsy I engine, £695; with a Hermes II, £745. The Mark IV Avian with metal fuselage and Hermes II engine having the same extra and new equipment as the wooden one, and the round type cockpit fairing with the split axle undercarriage will sell at £795. The Sports Avian has now been modified to include doors to both cockpits and a new type of wind screen; the engine has also been mounted on Silent Block shock-absorbing feet, and has an easily dismantleable silencer and tail pipe. This model will also be fitted with the semi-balloon tyres and the extra equipment, and with the Hermes II engine sells at £825, while with the Gipsy II engine the price will be £875.

CINQUE PORTS Flying Club.—The flying time for the week ending November 15 totalled 28 hr. 25 min. Of this no less than 11 hr. 15 min. was flying by licensed pilots. This is a very admirable percentage, which it is hoped that the pilots of other clubs will emulate. In spite of terrible weather during the week ending November 22, which completely stopped all flying on Wednesday, Thursday, Friday and Saturday, no less than nine "A" licence pilots flew on the Sunday and Monday, and the total of 14 hours in two days is really very creditable. One of the members of the club is Mrs. Atkey, who has been flying since before the war, long before flying clubs were started. She habitually flew a Mono-Avro, and the D.H.9 (Siddeley Puma). The annual general meeting was held on November 12, and a statement of the position showed that at the last general meeting the club possessed two Moths, a stock of spares and tools, £28 in the bank and £230 owing from the Air Ministry. The membership totalled 113, and the staff consisted of an instructor, a ground engineer and a steward. Now the club has grown to such an extent that its assets are three Moths, a spare engine, a large stock of spares and tools, and an enlarged club room, £1,200 in the bank and £200 owing from the Air Ministry, while the membership has increased to 150, and assistants have been taken on for the ground engineer and the steward. Owing to the pending reduction of the subsidy to about one-tenth of its existing value, extensive investigations have been made with a view to maintaining the financial basis of the club in the same firm state in which it now exists, and the following are the new regulations, to ensure this:—

"ENTERPRISE"!: An interior view of the 1931 model "Puss-Moth," which is being shown at the Paris Show. D.H. thoroughness is exemplified by all notices and instrument dials being engraved in the French language. (FLIGHT *Photo.*).

Flying charges will be £2 per hour for dual instruction and 30*s.* per hour for solo flying, increased to £3 per hour and £2 10*s.* per hour respectively for foreign members. These prices, to take effect from April 1, 1931. Subscriptions will remain mainly the same as at present, except that on April 1, 1931, the entrance fee for full flying members will be increased from £1 1*s.* to £3, while the monthly subscriptions will be increased from £1 1*s.* to 30*s.* Private owners, who have hitherto housed their machines free of charge, will now have to pay 10*s.* 6*d.* per week, or 1*s.* 6*d.* per night. Major C. F. Krabbe was re-elected Chairman, while Messrs. R. Dallas Brett and H. E. Thwaites were re-elected hon. secretary and treasurer. The committee will now be composed of Mr. A. Dallas Brett, Mr. K. F. H. Waller, Lt.-Comm. T. F. B. Gubbins, R.N., Mr. R. H. Drake, Mr. T. A. Lewis and Capt. R. A. Shadforth.



AN **AVIAN DEVELOPMENT: A view of an Avian belonging to the Lancashire Aero Club which is now fitted with 22 in. by 10 in. Goodyear Balloon tyres.**

A LINCOLNSHIRE AERO CLUB.—A meeting was recently held at the offices of the N.E. Steam Fishing Co., Grimsby, and it was decided to form the Lincolnshire Aero Club. Those interested should communicate with the hon. sec., Mr. C. Fisher, 46, Bradford Av., Cleethorpes.

THE DELHI Flying Club had a busy September, both as regards flying time and training. Four pupils passed their "A" test, two of whom, Mr. F. L. Gil and Mr. T. Eng-Aun, travelled all the way from Rangoon to do so. "A" pilots did a lot of flying throughout the month, and several cross-country flights were undertaken.

There were 10 members under training during the month, among them being Rana K. S. Jung Bahadur, Prince of Nepal, and eleven others received advanced instruction. The total flying time was 137 hr.

The Maharaja Sahib of Surgiya has become a Vice-Patron of the club and has made a generous donation to the club's funds. Since the beginning of September, six new members have joined the club.

ON "DOUGHNUTS": The 1931 Moth which is fitted with "Doughnuts" or Goodyear air-wheels, is here seen just taking off.
(FLIGHT *Photo.*)

GLIDING

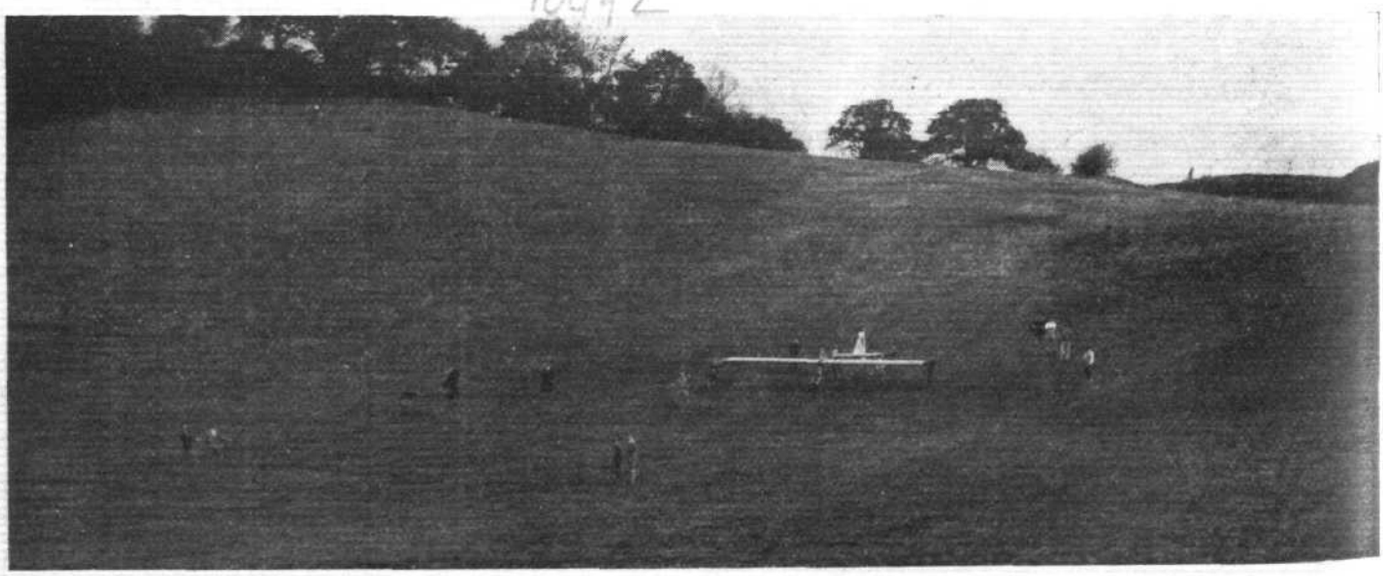
LEEDS Gliding Club.—The club took delivery of their first glider on Sunday last, November 23, but it was not until 4 p.m. that it was rigged and ready for use. Mr. C. St. L. Jervis, in spite of the gathering dusk, made a very good glide by the light of car headlights. A second machine is expected next week-end, and the club with two gliders of the Reynard type should very soon be able to turn out a large number of glider pilots.

WENSLEYDALE Club.—Mr. A. Fyfe Burns has been instrumental in forming a club at Richmond, Yorkshire, and nearly 20 keen members have already joined. The gliding site will be the moors bordering on Wensleydale, and within easy reach of Catterick Camp; that is, if the War Department sees fit to give permission for its use. Mr. S. P. H. Batty, of the Midland Bank, Richmond, Yorkshire, will act as Secretary and Treasurer.

SOUTHDOWN SKYSAILING Club.—Sunday, November 16, was a perfect day for gliding on the South Coast, and a large number of members turned up. Over 40 flights were made with the club's R.F.D. glider. Among the longer of these were two by Flt. Lt. Brown, the club's Captain, of 27 sec. each, and one by Capt. Russell of 19 sec. Flt. Lt. Brown, unfortunately, caught a sudden down-current when close to a tree, and his left wing went right through the branches. He was, however, able to retain control of his glider, and to straighten up. He maintained flying speed, and avoiding a crash, finished up by making a glide of over 24 sec. For particulars of membership, those interested should apply to the hon. sec., Mr. A. York Bramble, New Yorke Hotel, Bedford Square, Brighton.

A MANCHESTER LECTURE.—Col. The Master of Sempill will be giving a lecture on gliding before the Manchester Branch of the Royal Aeronautical Society at the end of the month. This branch has its own gliding section, and it is hoped to give a demonstration with their glider at an early date.

AN OXFORD INNOVATION.—The Oxford and County club's workshop at Cowley is now the scene of much feverish activity and secret work. As befits a club which originates in the home of one of the most go-ahead car factories of the world, they have decided to be original, and are constructing a glider in which the fuselage is a welded structure of steel tubing. A Dickson type training machine has already been built, and will be shortly tried-out on the club's training ground at Wroxton, near Banbury. This ground can easily be found by following the main Stratford-on-Avon road from North Bar, Banbury, and the club's sign will then direct them to the field.



A BEGINNER'S HOP: The Surrey Gliding Club launching one of their beginners well down the slope of their training hill. Their instructor, who may be seen in front of the glider, runs along and directs his pupils during their flight, by means of a megaphone. (FLIGHT *Photo.*)

STOCKPORT GLIDING Club are considering ways and means of securing a room in which they may construct their own glider, during the coming winter. Members will find plenty of work of an interesting nature to keep them quiet during the winter evenings, in constructing this machine. This is an exceptionally good way of retaining that first flush of enthusiasm with which such clubs are formed, during that difficult period when both weather and finance makes gliding and the acquisition of a machine a matter which has to be deferred. By building their own machine they will be able to obtain it at a very much cheaper rate than otherwise, and, moreover, will have acquired a large amount of exceedingly valuable experience in construction, which will stand them in good stead for their consequent inevitable repairs. When this Dickson type has been finished, it is proposed to proceed with a secondary or Prüfling type, so that by next spring members who are then efficient in gliding will be able to start soaring.

THE SCARBOROUGH Gliding Club continued practising at a ground on the Wolds above Flixton on Sunday, November 16. It was a bitterly cold day, with a sprinkling of snow on the ground, but quite a large number of enthusiasts turned out. Herr Magersuppe gave instruction to members in the club's two-seater machine, and two members qualified for their " A " certificates on the club's Zögling gliders, one of them, Mr. J. Young, making a flight of over 47 sec.

Miss Amy Johnson visited Scarborough on Sunday, where she received a great welcome as Vice-President of the Scarborough Gliding Club. As befits the name she has made for herself, she arrived by air, and the enthusiasm shown by the crowd was such that the police had their work cut out in order to get her to the hotel. She was accorded a civic welcome in the Town Hall and was presented with several mementoes of the occasion. After the reception, she visited the club's meeting at Flixton, and in the evening gave a lecture, which was followed by a dinner and dance in her honour, at the Royal Hotel.

THE EDINBURGH Gliding Club.—Mr. Lowe-Wylde demonstrated the Edinburgh Club's first glider on Sunday, November 16 at Comstin Farm, near Fairmile Head. After Mr. Lowe-Wylde's demonstration flight, many members of the club made successful glides under his tuition. Mrs. McKelvie, wife of Sqd. Ldr. J. A. McKelvie, the Chairman of the club, was the first woman member to make a flight. She first of all made one slide and then an excellent glide. Altogether during the afternoon some 25 members made successful flights, and of these, three were ladies. A further meeting will be held on November 30. It was unfortunate that the last glide of the day should have resulted in somewhat serious damage to the glider, but it is hoped to have another machine in time for the next meeting. Those interested in joining the club should apply to the hon. secretary, Mr. J. D. M. Currie, 16, Bernard Street, Leith.

NORTH KENT Gliding Club.—The North Kent Gliding Club has grown very rapidly, and although the inaugural meeting was only held on July 25 last, the number of members is already over 60. At a recent meeting at Joyce Green, Capt. Prangnell flew over from Heston Airpark with Mr. Rawson in an Autogiro, and the latter subsequently gave the assembled spectators, who numbered over 1,500, a thoroughly interesting demonstration. Practising will be continued every week-end on the club's glider each Saturday and Sunday, weather permitting.

THE AIRCRAFT Club, Harrogate, tested out the Dickson type glider, which they have built under the instruction of Mr. E. T. W. Addyman, on Sunday, November 16. The glider was taken a few miles from Harrogate to their glider ground in Wharfedale, and a large number of flights were made. Great enthusiasm was shown when it was realised that this home-made glider was an efficient machine, as the Harrogate club was one of the first clubs to start by building its own machine.

KENT Gliding Club.—The club held a meeting at Eastchurch on Sunday, November 23. This was the first meeting of a newly-formed Eastchurch section, and Flt. Lt. Crawford, acting as instructor, superintended a large number of glides by residents of the district. The members at Eastchurch are at present at work on a primary training glider of their own, and it is hoped this will be ready shortly. Next Sunday gliding will be carried on both at Eastchurch and Lenham. At the latter place the new hangar is now completed and the gliders will therefore not have to be dismantled after use. Members should note that on December 5 Mr. Mildrum will deliver a lecture on "Reminiscences of the early days of flying," while on December 12 a dance is being held at the Lower Brewery, Maidstone, tickets for which will be 3s. 6d. single and 5s. double.

GLIDING IN INDIA.—Mr. E. P. Raynham, writing in *Indian Aviation*, thinks it probable that many places will be found in India where exceptionally strong up-currents will make soaring flight easy, for not only are these formed by the wind being deflected at ranges of hills, but experience shows that strong up-currents exist over the plains, due to varying ground temperatures, even at heights of 10,000 ft.

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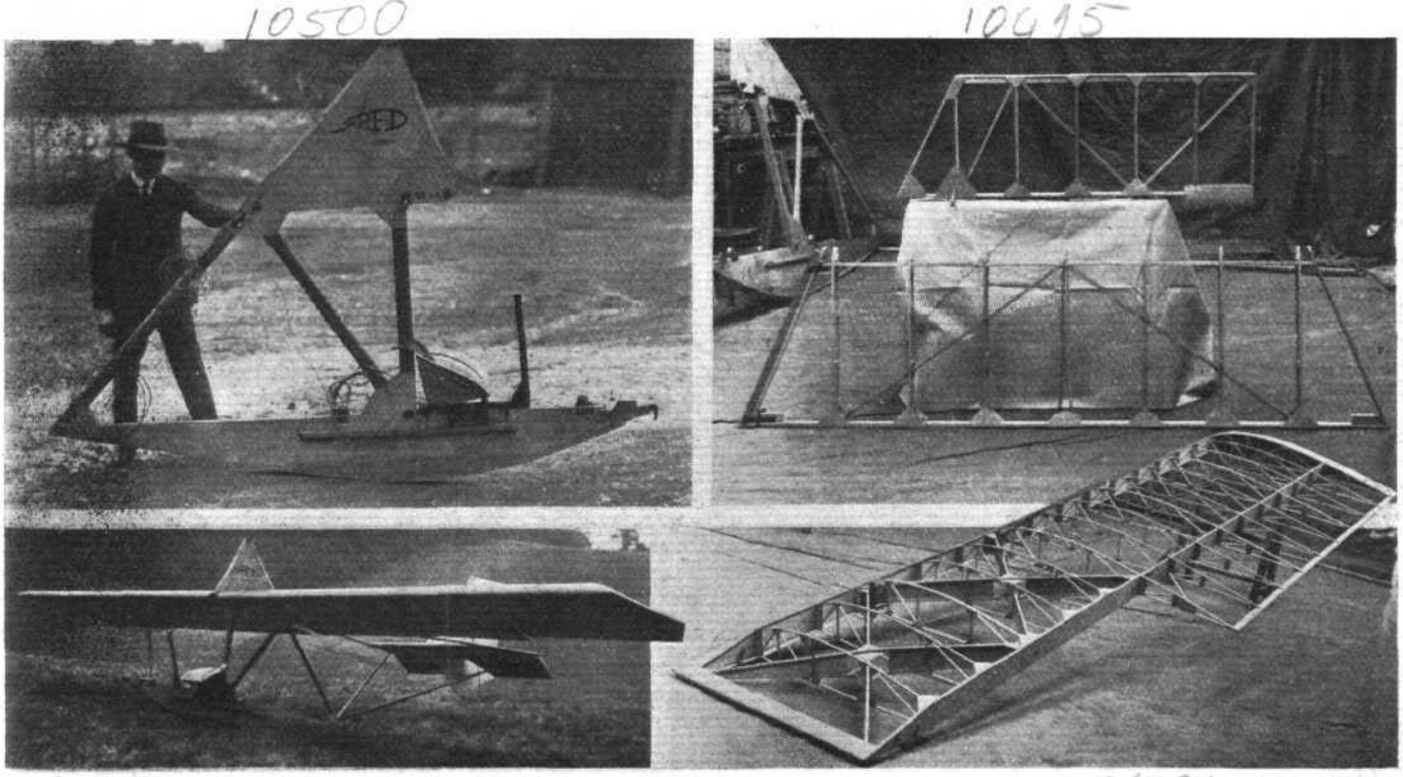


A BRITISH GLIDER : A series of photographs showing the R.F.D. " Dagling " under construction at Mr. R. F. Dagnall's works at Guildford. The " Dagling " is an improved Zögling type, cleaned up to give greater efficiency. (FLIGHT *Photos.*)

10494

AIR TRANSPORT

THE AIRWAYS OF AUSTRALIA

WE give below a summary of the various air services, subsidised and unsubsidised, at present operating in Australia, according to the latest information received in this country. Australia was the first of the British Dominions to adopt a policy of subsidising air services, starting nearly eight years ago with the service between Geraldton and Derby, which was worked by West Australian Airways, Ltd., under its remarkably capable managing director, Major Norman Brearley, D.S.O., M.C., A.F.C. This line was frankly experimental, but it has amply justified its existence, and is now regarded as indispensable by the State of West Australia. The subsidy has been progressively reduced from 4s. a mile to 2s. 5d. a mile, and still the line flourishes. Consequently air lines are now started by enterprising firms without any subsidy, and the success of Australian National Airways, Ltd., on the daily service between Sydney and Brisbane is most remarkable. Unfortunately, the present national financial difficulties have prevented the completion of the ambitious programme laid down by the late Government for ringing Australia completely with airways. There is still a gap between Adelaide and the two great cities of Melbourne and Sydney. There is, however, less need for airways in those parts where the rail services are good. Further to the north the need for air services becomes apparent.

We hope to deal in an early issue with the beginning of aircraft and aero engine construction and design in Australia, notably the aeroplanes designed by Mr. Shackleton for the Larkin firm.

SUBSIDISED AIR SERVICES.

West Australia Airways, Ltd.

Perth-Derby. 1,467 miles. Machines leave Perth on Wednesdays and return on Mondays. Landing places for mails are :—Perth, Geraldton, Carnarvon, Onslow, Roebourne, Whim Creek, Port Hedland, Broome, Derby. Fleet : Six D.H.50 A's (Nimbus). Has been flying about nine years. Average over 20,000 letters per mensem. The subsidy rates are 2*s.* 7*d.* per mile in the first year of the new three-year contract, 2*s.* 6*d.* for the second year, and 2*s.* 5*d.* for the third year. In the late contract the rate was 2*s.* 11*d.* per mile.

Adelaide-Perth. 1,453 miles. Opened June 2, 1929. Contract for five years. Landing places :—Adelaide, Ceduna, Forrest, Kalgoorlie, Perth. Night is spent at Forrest, where a hostel has been built. Fleet :—four 14-seater Hercules with three Jupiters each. Night-lighting equipment (rotating beacons and flood lights) has been installed along the route, but is only used when the machine is detained by late arrivals of the train at Adelaide or the steamer at Fremantle.

The contract requires the company to take all air mails in Perth on arrival of the steamer from England and deliver them in Adelaide next day in time to catch the train leaving at 4.30 p.m. for Melbourne, Sydney, etc. Westward mails are picked up on arrival of the train in Adelaide and must catch the outgoing steamer from Fremantle next day. A week is saved on reply to an English letter.

Derby-Wyndham. 600 miles. Opened July 13, 1930. The route is via Fitzroy Crossing and Hall's Creek. The aerodromes can only be used in the dry season, that is, for about eight months of the year. The subsidy rate is 3*s.* 3*d.* per mile.

Qantas.

Brisbane-Camooweal, and to Normanton.

	Miles.	Started.
Brisbane-Charleville ..	444	April 17, 1929.
Charleville-Cloncurry ..	577	November 2, 1922.
Cloncurry-Camooweal ..	248	February 7, 1925.
	1,269	
Cloncurry-Normanton	215	
Total mileage ..	1,484	

Landing Places :—Toowoomba, Roma, Charleville, Tambo, Blackwall, Longreach, Winton, Mackinlay, Cloncurry, Mount Isa, Camooweal. The route takes 15 hours flying time. The services are weekly in each direction.

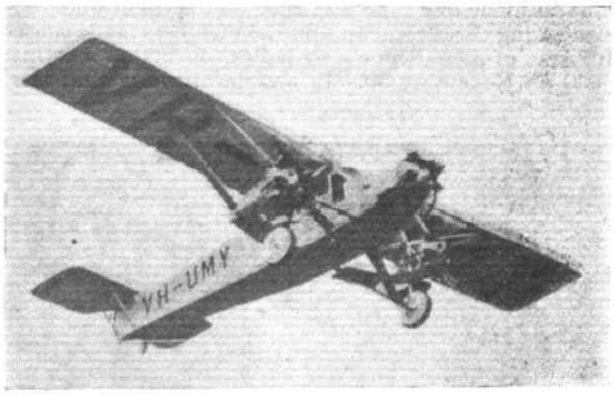
The stages Brisbane-Charleville and Charleville-Longreach are worked by two Giant Moths (D.H.61, with Jupiter), and the northern stages by six D.H.50's with Jupiter or Puma engines. In the new three-year contract the subsidy rate is 2s. 9*d.* a mile for the first year, 2*s.* 8*d.* for the second year, and 2*s.* 7*d.* for the third year. The previous rate was 3*s.* 2*d.* a mile north of Charleville, and 3*s.* 1*d.* a mile on Brisbane-Charleville.

Larkin Aircraft Supply Co., Ltd.

Camooweal-Daly Waters. Established February 20, 1930. 475 miles. The time table is co-ordinated with Qantas. Fleet :—two D.H.50A (Jupiter). It was expected that the rail from Darwin would reach Daly Waters before the air service was established, but the Government is not now bringing the line south of Birdum Creek, 50 miles north of Daly Waters. The present connection is by road service, which in the wet season means by pack horse. So the Government is negotiating with the Larkin firm for an extension to the rail head. The subsidy rate is 3*s.* 4½*d.* a mile or £8,336 per annum.

Discontinued Services. In 1923-4 the Larkin firm operated Adelaide–Sydney (790 miles) for a year. From Cootamundra to Sydney the route is hilly and the train service is adequate, so this section was discontinued in July, 1925, and instead contracts were granted for branch lines, twice weekly in each direction, Mildura-Broken Hill and Hay-Melbourne. It was held that the amount of traffic did not justify the renewal of the subsidy, so all these lines came to an end on June 9, 1930.

Early in 1930 the Larkin firm or its subsidiary, Australian Aerial Services, Ltd., started air services Melbourne-Adelaide and Mildurak–Cootamundra, but they have been discontinued.



THE "LASCONDOR" MONOPLANE: A three-engined (Armstrong-Siddeley "Mongoose"), seven-seater commercial machine, designed and built by the Larkin Co.

UNSUBSIDISED SERVICES.

Australian National Airways, Ltd. Founded by Messrs. Kingsford Smith and Ulm.

Brisbane-Sydney. 500 miles. Service daily in each direction with Avro 10's (three Lynx), carrying eight passengers as well as crew. The flight takes six hours. It has been very well supported by the public in its nine months of operation.

Sydney-Melbourne. 480 miles. Service commenced June 1, 1930. Daily each way. This line is in direct competition with a good railway line. To counteract this, night flying is proposed, but has not yet been instituted.

Queensland Air Navigation Co., Ltd.

Brisbane-Townsville. 728 miles. The service commenced on March 31, 1930, and runs twice weekly each way. The aircraft used are Avro 10 and Avro 5. The company will extend the service northwards to Cairns (180 miles) as soon as the municipality has prepared an aerodrome. It is also considering the purchase of an amphibian or flying boat to connect Cairns with New Guinea.

Commercial Aviation Co., Adelaide.

Adelaide-Renmark. 140 miles. Three times weekly in each direction (Mondays, Thursdays, and Saturdays). Route via Waikerie, Loxton, and Barmera.

This firm started a service Adelaide-Mount Gambier this year, but it has been discontinued.

Eyre Peninsula Airways, Ltd., Adelaide.

Adelaide-Streaky Bay in Eyre Peninsula. 310 miles. Twice weekly in each direction, leaving Adelaide Mondays and Fridays, and Streaky Bay on Tuesdays and Saturdays. Route via Wallaroo, Cowell, Kimba,and Kyancutta.

Adelaide-Broken Hill. 260 miles. Weekly in each direction, leaving Adelaide on Wednesdays and returning next day.

Aircrafts Pty. Ltd., Brisbane.

Brisbane-Toowoomba. 75 miles. Daily in each direction except Mondays and Wednesdays.

OTHER SERVICES

The services in New Guinea deserve separate notice, and we hope to deal with them more fully at an early date.

Matthews Aviation Pty., Ltd., have taken delivery of a Saro "Cutty Sark," and it is understood that the firm will shortly open services between Melbourne and Tasmania.

Up to the end of May last, the subsidised airways had flown 3,087,643 machine miles, 3,822,042 passenger miles, and had carried 24,509 paying passengers. In regularity and freedom from serious accidents, the Australian subsidised airways are unsurpassed by air lines in any part of the world.

The Commonwealth Government has acquired or leased 185 aerodromes and landing grounds. Municipalities are now setting up their own aerodromes, and the Brisbane-Townsville service has resulted in the opening of new aerodromes at Maryborough, Bundaberg, Rockhampton, Mackay, Bowen and Cairns.

AUSTRALIAN NATIONAL AIRWAYS

AUSTRALIAN National Airways, Ltd., the company operated by Air Com. Kingsford-Smith and Fl. Lt. Ulm, has—as announced briefly in a previous issue of FLIGHT—made exceptional progress since its inauguration. Below we give some detailed figures regarding this company's position, which we think may be of interest.

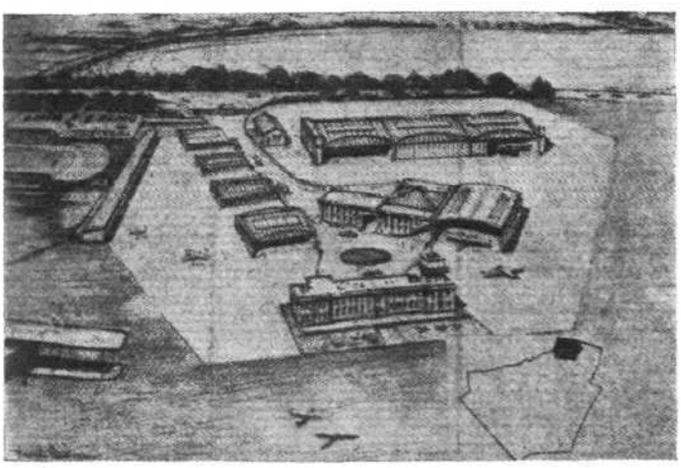
The first accounts of A.N.A. disclose net earnings of £7,429, and after providing £4,696 for depreciation and £243 for insurance, net profit amounts to £2,489. Dividend for the half-year ended June 30 at the rate of 8 per cent. per annum absorbs £2,290, and £199 is carried forward.

It is explained that the accounts cover 18 months to June 30. The first 12 months to December 31 last represent the period from the company's formation to the inauguration of the regular air mail and passenger services, and the remaining period the operation of the Sydney-Brisbane service for six months, and the Sydney-Melbourne service for one month. For the six months ended June 30 the company transported 2,919 paying passengers and 7,297 lb. air mail. Paid-up capital is £60,964. Creditors, including overdraft, amount to £18,133. The assets total is £81,829, which includes goodwill £12,500 and preliminary expenses £4,097. Aeroplanes and plant, less depreciation, are valued at £45,458, hangar, less amortisation, of £4,990, and tools and stocks at £7,592. Sundry debtors and cash are down at £3,154, and insurance prepayments at £3,792.

It is interesting to note that A.N.A. Avro 10's have now flown over a million and a-half engine miles with 19 Armstrong Siddeley "Lynx" engines (the "10," it will be remembered, is fitted with three of these engines). During the period, it is stated, not one single regular service flight was uncompleted owing to mechanical failure.

DONCASTER'S AIRPORT

AS briefly recorded in a previous issue of FLIGHT, the Corporation of Doncaster on November 5 approved in principle a scheme, prepared by Sir Alan Cobham, for the establishment of an aerodrome on the Low Pasture and certain adjoining lands at an estimated total cost, when complete, of £120,000 (including purchase of land).



DONCASTER'S FUTURE AIRPORT: An "aerial view" of the proposed municipal aerodrome on the Low Pasture as it will be if the scheme prepared by Sir Alan Cobham is carried out. Behind the aerodrome buildings are the Great North Road and the Race Course, and on its left the Rovers' ground. The ground immediately surrounding the hangars and other buildings, shown white in the main drawing, is represented by the black patch in the top corner of the small inset sketch, which thus indicates the area of the whole aerodrome site in proportion to that included in the architect's drawing.

In view of the fact that the Town of Doncaster interested itself in aviation as long ago as 1909, when it organised a flying meeting, we think the following additional notes regarding the new aerodrome may be of interest. We also reproduce the architect's drawing of the proposed municipal airport as it would appear if Sir Alan Cobham's scheme is completely carried out.

As Sir Alan points out, the position of Doncaster in the centre of England is an excellent one, being on a direct route from London to the North, and at the same time situated conveniently between Ireland, Liverpool, Manchester and Hull or Grimsby when considering an East to West service from Scandinavia and to Germany. Doncaster is situated far enough from the hills lying in the centre of England to be free from low-cloud troubles, while the problem of local fog is not more serious than that encountered at other towns in the country. Furthermore, the site of the aerodrome itself is close to the centre of the town—in which Doncaster is more fortunate than most places—while being adjacent to the Race Course, passenger traffic by air may be expected to develop rapidly.

Sir Alan's scheme and plans deal with the airport in three stages of development, the first being that of preparing the ground and erecting the necessary buildings so that the airport, as such, may receive the Air Ministry Licence and be open for public use. This work should occupy a period of approximately one year from the commencement of operations, and is the responsibility of the County Borough of Doncaster.

The second and third stages deal with work to be carried out in future, the final stage visualising the complete airport developed by municipal and private enterprise as and when traffic warrants extensions.

A New Machine for Northern Air Lines

NORTHERN AIR LINES, LTD., have recently acquired a D.H.50A, to carry four passengers and pilot, for use in connection with their air taxi work from Barton Aerodrome, Manchester. This machine was christened *The Lancastrian* by Alderman Davy, chairman of the Manchester Aerodrome Special Committee, on November 13, and is their first "enclosed" machine. Northern Air Lines are carrying out a considerable amount of air taxi work, and their rates are about the cheapest of any in the country for passenger transport, working out at 6*d*. per mile per person.

Air Mails to Austria and Balkans

IN consequence of the suspension of night flying during the winter, on a section of the route of the French Air Mail service from Paris to Prague, Vienna and Budapest, the latest time of posting air mail correspondence from this country for Austria, Bulgaria, Czecho-Slovakia, Greece, Jugo-Slavia, Hungary, Poland and Rumania, which has hitherto been 2.30 p.m. (except Saturdays) at the G.P.O., London, will in future be 11 a.m. (except Saturdays), and correspondingly earlier elsewhere.

AIRISMS FROM THE FOUR WINDS

R.A.F. West African Flight

THE flight of No. 47 Bomber Squadron, under the command of Sqdn.-Ldr. E. L. Howard-Williams, M.C., which has flown in formation from Khartum to Bathurst, in Gambia, has arrived back at Khartum. The flight left Geniena on Monday, November 24, and arrived at El Fashir the same evening. It left next day for El Obeid, and reached its home station at 1.45 p.m., local time, on Tuesday, November 25. This is the first time that a unit of the Royal Air Force has visited the colony of Gambia, on the west coast of Africa, though more than once units have flown as far as Kano, in Nigeria. No rumour of any mishap to this flight has been reported. It has been an entirely successful undertaking, and it reflects great credit on the squadron and its commander, on the Fairey 3 F aeroplanes, and last, but by no means least, on the Napier Lion engines.

The Next R.A.F. Cairo-Cape Flight

No. 216 (Bomber) Squadron, stationed at Heliopolis, and commanded by Wing Commander E. A. B. Rice, M.C., has been selected to make the next long-distance flight from Cairo to Capetown and back.

The Prince's South American Tour

THE PRINCE OF WALES, accompanied by his brother, Prince George, will leave England in the P.S.N. liner *Oropesa*, on January 15, en route for Buenos Aires, where he will open the British Empire Trade Exhibition on March 14. We understand that the Prince will be taking his private aeroplane with him, and will make a number of flights in the Argentine.

French Airwomen's Flights to the Far East

MLLE. MARYSE HILZ left Villacoublay on November 12, with the object of flying to Saigon, Indo-China. She is flying a Morane "Moth" ("Gipsy" engine), and reached Marseilles on the first day, and Gorizia on the second. She arrived at Karachi on November 22, and Calcutta on November 24.

Another French airwoman, Mlle. Lena Bernstein, left Toussos-le-Noble on November 7, en route for Japan, accompanied by her mechanic, M. Guitton. It was reported that she subsequently damaged her machine on reaching Baghdad.

An Endurance Record Attempt

MM. BOUSSONTROT and ROSSI, the two well-known French airmen, last week made a splendid effort to beat the world's endurance record of 67 hr. 13 min., set up by the Italians, Maddalena and Ceccioni. Flying the new Bleriot "grand raid" monoplane, fitted with a 600-h.p. Hispano, they flew in a closed circuit at Oran for 67 hr. 33 min., thus beating the previous record by 20 min. This, however, was not sufficiently in excess to be officially recognised.

The Howden Design Staff

HOWDEN airship station is closing down next Monday, and the skeleton staff which has kept the place going for the past year has now to face the hard task of finding new employment. This is always a tragic and difficult business, and one must feel great sympathy for a highly efficient set of engineers, the pick of those who were responsible for the drawing office work on R 100—no mean achievement! We are very glad to hear that most of the stress-calculators have found new posts, but on the other hand, the actual draughtsmen are not in the same happy position. Will any employer who has a vacancy for a good draughtsman please note?

Col. Lindbergh and South America

COL. AND MRS. LINDBERGH expect to pay a visit to South America some time, and this gave rise to a story that it was intended to make the tour in rivalry to the visit of the Prince of Wales, in order to counteract any possible diversion of aircraft orders from the United States to Great Britain. Col. Lindbergh has denied the rumour, and ridiculed it, stating that the date of his visit to South America has not been settled.

A Puss Moth for the Paris Show

THE De Havilland Aircraft Co., Ltd., announce that they are exhibiting, on the stand of Morane Saulnier's, at the Paris Aero Show, a Puss Moth cabin aeroplane. The machine will be finished in cream and red, and will be of the latest type. Capt. H. S. Broad, A.F.C., who is well known throughout Europe as the company's test pilot, will be in charge of this exhibit.

Russell Lobe Parachute

READERS who are interested in the Russell Lobe parachute should take note that the address was inadvertently given in last week's issue as Edgware Road; this, of course, should have been The British Russell Parachute Co., Dominion Works, Dunsmuir Road, Stoke Newington.

Our 3-Language Issue

ONE of the drawbacks to publishing an article in three languages, as we did with the British Aircraft Industry number of FLIGHT last week, is that it is very difficult indeed to ensure that the translations are well done. The aviation terms used in nearly all languages are of a colloquial nature, and unless the translators are familiar with the terms in common use, the results are likely to be unsatisfactory.

We were fortunate enough to choose Mansons (Translators), Ltd., of 6, John Street, Adelphi, London, W.C.2, to undertake the very considerable task of translating into French and Spanish most of the text of our special number last week, and we desire to place on record our appreciation

PARIS GETTING READY FOR THE SHOW: This photograph shows a corner of the Grand Palais where the 12th International Aero Show opens on Friday of this week. The twin-fuselage Bleriot monoplane will be one of the "sights" of the Show. The machine on the right is a Liore & Olivier 4-engined Bomber, while the Commercial Monoplane in the foreground is of unknown parentage.

of the way in which the work was done. Of the success of the translations our foreign readers will be able to judge better than we can, but of the excellent service given by Mansons we can speak with personal knowledge, and it would be impossible for any firm of translators to have taken greater trouble than they did. Whenever an expression seemed a little ambiguous in the English text, they telephoned us to ascertain the exact meaning, when less conscientious translators would merely have given a translation of sorts and trusted to luck that it represented the exact meaning it was desired to convey.

In the matter of promptness we could not have asked for better service. Although many hours of night work must have been entailed, we were never kept waiting. And before we went to press with the special number of FLIGHT, the translators volunteered to read all the slip proofs of the foreign text so as to ensure that no misprints should be passed for press. That we altogether escaped misprints would be too much to hope for, but the translators did all they possibly could to assist us. If any British firm has technical material which is to be translated, we do not think it would be possible to do better than go to Mansons.

Large Orders for Hawker Aircraft

IT has been known for some time past that the Air Ministry had decided to adopt the Hawker interceptor fighter first known as the " Hornet " and now renamed the " Fury," for use in the Royal Air Force. It is understood that very shortly contract orders will be placed with the H. G. Hawker Engineering Co., Ltd., of Kingston-on-Thames, for some 200 machines, both " Furies " and " Harts." The " Hart " has been in use by No. 33 Bomber Squadron for some time and has won the highest praise. Its performance is really extraordinary. The " Fury," though it was run very close by another very good machine in the competition for interceptor fighters, may also be called the finest machine of its special class in the world. Several squadrons of Air Defences of Great Britain will, it is understood, soon be equipped with the " Hart " and the " Fury," respectively. Incidentally, it may be mentioned that for the future the names of all fighter landplanes are to begin with the letter F. At the same time, both these machines are being adapted for use as ship-planes, and will be issued to the Fleet Air Arm. It is to be the rule that all machines used by the Fleet Air Arm shall have names beginning with the letter N, so both these Hawker types must be renamed for their ship-plane incarnation. It is expected that the " Fury " will be called the " Norn," but this has not yet received Admiralty sanction.

Faireys for Belgium ?

IT is reported that an order for 45 Fairey " Firefly " interceptor fighter aircraft has been placed by the Belgian Government with the Fairey Aviation Co., Ltd., of Hayes.

No. 23 (FIGHTER) SQUADRON, R.A.F.

11400

The full complement of 12 Closter Gamecocks (Jupiter engines) of No. 23 (Fighter) Squadron at Kenley.

MODELS

SOCIETY OF MODEL AERONAUTICAL ENGINEERS (S.M.A.E.)

MEMBERS of the S.M.A.E., and affiliated clubs, who attended the second meeting of the winter season at the Y.M.C.A., Tottenham Court Road, on November 13, had to thank Mr. E. H. Brindley, of the Balsa Wood Co., for an extremely interesting and instructive talk on "Balsa Wood." At last members felt that they were learning something about this extremely "peculiar" wood, which weighs anything from 5 to 15 lb. per cubic foot. Mr. Brindley commenced with a description of the growth of "Balsa Wood" in the forests of Ecuador, and went on to give his hearers a complete history of the application of "Balsa" to the aircraft and other industries in which it could be used. At the conclusion of his talk, Mr. Brindley had to answer numerous questions from members anxious to make full use of this wood in model construction, and the meeting then terminated with a hearty vote of thanks to the lecturer for his very interesting and instructive talk.

On Thursday, November 27, an informal dinner will be held at "Le Diner Francaise," 16, Old Compton Street, W.C., at 7.30 p.m. All members of the S.M.A.E., and affiliated clubs, are welcome. The secretary will be glad if those intending to be present will notify him: S. G. Mullins (Hon. Sec.), 72, Westminster Avenue, Thornton Heath, Surrey.

Flying Meeting at Brooklands Aerodrome.—The members of the S.M.A.E. and affiliated clubs have been invited by the Brooklands School of Flying, Ltd., to give a display of model flying before their pupils on Sunday afternoon, December 7.

A competition for fuselage models (duration) will be held, the prizes being:—1st Prize—A trial lesson in a Brooklands School Machine. 2nd Prize—A free flight in a Brooklands School Machine. 3rd Prize—Ditto.

These prizes have been kindly presented by the Brooklands School of Flying, Ltd., who have also promised to show members, and their friends, over the school workshops, etc.

It is hoped that as many members of the S.M.A.E., and affiliated clubs as possible will support the meeting in view of the excellent prizes offered.

Admission to the aerodrome will be by free pass, or by paying at the gate. Will those desiring to be present please write to the Hon. Secretary for their free pass, also stating whether they wish to take lunch at the restaurant, on the aerodrome, Captain Davis having made arrangements for an excellent 2*s*. lunch for those who will be arriving early. The nearest station to the aerodrome is West Weybridge from Waterloo.

THE MODEL AIRCRAFT CLUB. (T.M.A.C.)

Flying on Parliament Hill.—Sunday morning, November 16, was very raw, and only a few enthusiasts braved the November weather, but what was lost by numbers was made up by the enthusiasm and quality of the flying. Mr. L. Mann was the first to take off, and he gave us a very pretty exhibition of automatic control. His model in flight gives one that feeling of satisfaction which all aero-modellists hunger for. The model itself is a parasol type monoplane with a perfectly flat 'plane (no dihedral), and the elevator is controlled by a pendulum which swings forward as the nose drops and pushes the elevators up—so brings the tail down for a faultless three-point landing. When one watches these evolutions the annoyance of long and rough grass when actually settling down is exasperating.

Mr. Buckland was giving consistently good flights with a High Wing Cantilever Monoplane weighing under 4 oz. This model repeatedly flew and climbed until the motor "ran out," and then terminated its journey with a perfect slow glide and three-point landing, which demonstrated perfectly the soundness of both design and construction.

Mr. Fennell was also there with his High Wing Monoplane and, whilst not giving the same consistency of climb as Mr. Buckland (60 ft.), none of his flights were lower than 30 ft. or 30 seconds' duration, which speaks volumes for a beginner and his first model.

Mr. Dods, with the assistance of Mr. Davis, was getting good sport with a "super-heavyweight 'bus," a mid-wing monoplane, which turns the scale at $1\frac{3}{4}$ lb. After getting correct trim one skein of elastic gave up the ghost; but after a further adjustment Mr. Dods put up a fine straight flight of about 500 yards in approximately 30 seconds, with only one skein in full operation.

"Resurgam" was there doing her stuff, and although duration was not very great she has a very good landing angle and can on occasion R.O.G. when suitable ground is available.

Several spar models were there but nothing outstanding occurred amongst them. The best one was an "all wire" model (excepting Prop., spar and silk) which very effectively proved its claim to being "crash proof" because, in spite of some very rough handling, during which the propeller shaft broke, it was still merrily gliding when the meeting broke up.

Judging by the remarks heard during the morning anent new models, special winders, and new wing shapes and sections, next Sunday should show up something real good in the way of "new stuff."

The development scheme of T.M.A.C. is going on apace, and at a very early date it is hoped to hold the inaugural meeting of the 4th Wing (under the supervision of Mr. M. R. Knight) at their new flying ground on Lea Marshes. This meeting will be followed at weekly intervals by the inaugural meetings of the other wings now formed, and each gathering will have its competitions for Squadron and Flight-Leader positions, and visitors (with models).

Indoor Flying.—Monday evening November 17, produced a variety of models, new faces and visitors—the number present totalled 53, and although there were many first models of clever design and construction the older hands were well able to hold their own. Mr. A. T. Willis increased his duration figures to 1 min. 41 secs (spar tractor hand-launched) whilst Mr. Newell maintained his figure of 43 sec. R.O.G. with his beautiful low-wing fuselage model monoplane, the sight of which in flight is one of those pictures of which one never gets enough, and when the competitions are held on December 13, it will undoubtedly hold a leading position for whatever event it is entered—in the same way that his "Falcon" has at outdoor meetings. The newcomers to this branch of model flying showed great improvement—especially Master Kimpton.

Many of the visitors had models and put up a very good display, which gave one the idea that the S.M.A.E. had been invited in force. Mr. Pelly-Fry, who was present through the courtesy of Mr. Burchell, was doing his best with a spar model which had a peculiar knack of jumping or kicking whilst in flight (average duration 15 secs.), which was to some a disappointment after having seen his outdoor models at work.

Mr. Bullock (S.M.A.E.) showed distinctly what patience and perseverance can do by putting up a duration of 2 min. 29 sec., which was a startling improvement on his attempt at the previous meeting (25 sec.). This received the well merited applause of all present, and, whilst not being the prettiest flyer there, it certainly "stays put" when it takes the air.

Mr. Debenham's "Puss Moth" was the nearest approach we have seen to a flying scale model (indoor) but one has the feeling that it would be better suited to outdoor conditions.

The next meeting on December 10, will be the last occasion on which members can carry out tests for the Christmas competitions on December 13 (2 p.m. to 6 p.m.). Hon. secretary, A. E. Jones, 48, Narcissus Road, Hampstead.

French Helpers in R 101 Disaster

THE British Embassy at Paris has issued the following announcement:—"The King having been pleased to grant decorations to a number of persons who took part in the salvage operations on the occasion of the disaster to the R 101, His Majesty's Ambassador will present the insignia of these decorations at the Hotel de Ville, in Beauvais, on December 3."

Simultaneously, Lord Tyrrell will present to the towns of Beauvais and Allonne, to the hospital of Beauvais, and to a number of persons who rendered aid on that occasion, tokens of gratitude from the British Government.

Wing Commander Colmore's Will

WING COMMANDER REGINALD BLAYNEY BULTEEL COLMORE, O.B.E., of The Nook, Heronsgate, Herts, director of Airship Development (responsible director for airship activities in the Air Ministry), formerly of the Royal Navy, who was killed in the R 101 disaster at Beauvais, France, on October 5, aged 43, left £6,155 gross, with net personalty £4,704. The whole of the £6,155 is left to his widow, and the will makes the request—but without creating any trust—that if Mrs. Colmore remarries she shall hold all but £1,000 of the estate for Wing Commander Colmore's children.

THE ROYAL AIR FORCE

London Gazette, November 18, 1930.

General Duties Branch

Lt.-Cdr. S. Richardson, R.N., is reattached to R.A.F. as Flight Lt., with effect from Sept. 17, and with seny. of July 1, 1927. The following Pilot Officers are promoted to rank of Flying Officer :—R. P. Cauthery, H. M. B. Collins, C. E. Hartley, P. B. Lusk (Oct. 2) ; E. H. Coleman, G. Farnhill, J. E. Loverseed, E. J. K. Megaw, M. E. M. Perkins, R. Todd, F. Whittingham, D. H. G. Wood (Oct. 13) ; H. C. Singleton (Oct. 14).

Squadron-Leader A. C. Collier ceases to be seconded for duty with Estonian Government (Sept. 5) ; Squadron Leader E. D. Atkinson, D.F.C., A.F.C., is placed on half-pay list, scale A (Oct. 1) ; Flying Officer F. Fazey is placed on retired list on account of ill-health (Nov. 15) ; Flight-Lt. H. F. Jenkins is transferred to Reserve, Class A (Nov. 7) ; Flight-Lt. Russell Wykeham Morgan Hall resigns his short service commn. (Nov. 14) ; the short service comms. of Pilot Officer on probation Richard Ruston is terminated on cessation of duty (Nov. 18).

Medical Branch

The following Flight-Lieuts. are transferred to Reserve, Class D (ii) (Nov. 15) ; M. Clancy, L.R.C.P. and S. C. P. O'Toole, L.R.C.P. and S.

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Flying Officer J. F. A. Baker is transferred from Class C to Class A (Sept. 27) ; Pilot Officer C. Bland is transferred from Class AA (ii) to Class C (Nov. 14) ; Flight-Lt. C. H. N. Nunn relinquishes his commn. on completion of service (Nov. 10).

Accountant Branch

Flying Officer H. Hedderwick relinquishes his commn. on completion of service (Sept. 30).

AUXILIARY AIR FORCE

General Duties Branch

No. 602 (City of Glasgow) (Bomber) Squadron.—Flying Officer D. H. Back is transferred to No. 604 (County of Middlesex) (Bomber) Squadron (May 1).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Air Vice Marshal E. R. Ludlow-Hewitt, C.B., C.M.G., D.S.O., M.C., H.Q., Iraq Command, on appointment as Air Officer Commanding ; 18.10.30.

Group Captains : E. D. M. Robertson, D.F.C., to Air Ministry, on appointment as Dir. of Personal Services ; 10.11.30. R. E. C. Peirse, D.S.O., A.F.C., to H.Q., Coastal Area, pending posting to Air Ministry ; 7.11.30.

Wing Commander E. Osmond, C.B.E., to R.A.F. Depot, Uxbridge ; 1.11.30. W. R. Read, M.C., D.F.C., A.F.C., to Station H.Q., Boscombe Down, to command ; 3.11.30.

Squadron Leaders : F. J. Linnell, O.B.E., to No. 9 Sqdn., Manston ; 20.10.30. E. K. Openshaw, to No. 111 Sqdn., Hornchurch ; 10.11.30.

Flight Lieutenants : D. S. Allen, to No. 1 Sch. of Tech. Training (Apprentices), Halton ; 1.11.30. G. H. Vasse, to No. 15 Sqdn., Martlesham Heath; 1.11.30. G. R. Beamish, to Home Aircraft Depot, Henlow ; 1.11.30. R. L. Edward, to No. 16 Sqdn., Old Sarum ; 4.11.30. J. F. A. Day, A.F.C., to No. 12 Sqdn., Andover ; 7.11.30. C. McM. Laing, M.C., A.F.C., to Station H.Q., Bircham Newton ; 4.11.30. F. C. B. Savile, to No. 7 Sqdn., Worthy Down ; 10.11.30. L. M. Elworthy, to No. 33 Sqdn., Bicester ; 4.11.30. R. B. Sutherland, D.F.C., to Station H.Q., Boscombe Down ; 3.11.30. D. M. Fleming, to No. 22 Sqdn., Martlesham Heath ; 3.11.30. G. Combe, to Station H.Q., Boscombe Down ; 3.11.30. J. C. E. A. Johnson, to No. 99 Sqdn., Upper Heyford ; 7.11.30. G. J. Southam, to Station H.Q., Boscombe Down ; 3.11.30. J. R. Brown, D.F.C., to No. 7 Sqdn., Worthy Down ; 10.11.30. A. H. Wheeler, to H.Q., Iraq Command ; 18.10.30. H. H. V. Tristem, to Armament and Gunnery School, Eastchurch ; 23.10.30.

Flying Officers : W. Gill, to No. 1 Sch. of Techn. Training (Apprentices), Halton, 20.10.30. F. Gower-Jones, to No. 15 Sqdn., Martlesham Heath, 27.10.30. P. G. J. Atkinson, to Station Administration, Halton, 29.10.30.

Flying Officers : E. H. Irving, to No. 12 Sqdn., Andover ; 4.11.30. J. M. Wells, to Station H.Q., Andover ; 4.11.30. A. M. Butt, to No. 12 Sqdn., Andover ; 4.11.30. R. I. Johnson, to No. 10 Sqdn., Upper Heyford ; 1.11.30. R. C. Dawkins, to Sch. of Army Co-operation, Old Sarum ; 1.11.30. F. Miller, to Sch. of Balloon Training, Rolleston Camp ; 1.11.30. A. M. D. Howes, to R.A.F. Base, Gosport ; 1.11.30. G. R. Weighill, to No. 13 Sqdn., Netheravon ; 30.10.30.

Pilot Officers : G. F. Goddard and G. Nelson, to No. 3 Flying Training Sch., Grantham, on appointment to permanent commn., 25.10.30. K. R. Warton, to No. 3 Flying Training Sch., Grantham, on appointment to a short service commn., 28.10.30. N. R. G. Hunter, to No. 58 Sqdn., Worthy Down, 30.10.30.

Pilot Officer : L. W. C. Bower, to No. 33 Sqdn., Bicester ; 4.11.30.

Stores Branch

Flight Lieutenant J. S. Browne, to Station H.Q., Boscombe Down ; 3.11.30.
Flying Officer J. R. R. Harvey, M.M., to Aircraft Depot, Iraq ; 20.10.30.

Accountant Branch

Squadron Leader G. N. Simon, to Station H.Q., Manston ; 7.11.30.

Flight-Lieutenants : B. L. Blofeld, to Aeroplane and Armament Experimental Estab., Martlesham Heath, 24.10.30. R. W. L. Glenn, to Station H.Q., Boscombe Down, 4.11.30.

Flying Officers : R. A. J. Mullarkey, to No. 26 Sqdn., Catterick, 3.10.30. J. P. Cave, to No. 2 Armoured Car Company, Ramleh, 20.10.30.
Flying Officer G. H. White, to No. 84 Sqdn., Iraq ; 24.10.30.

Medical Branch

Wing Commander B. A. Playne, D.S.O., to Central Med. Estab., for duty as President of the Medical Board, 10.11.30.

Flight-Lieutenants : E. C. K. H. Foreman, to H.Q., R.A.F., Mediterranean, 29.10.30. J. J. Quinlan, to Station H.Q., Upavon, 16.11.30. R. F. MacLatchy, to Station H.Q., Boscombe Down, 1.11.30.

Dental Branch

Flying Officers : S. C. Allen, to Medical Training Depot, Halton ; 13.10.30 ; F. F. Kennedy, to Medical Training Depot, Halton ; 15.10.30 ; both on appointment to non-permanent commns.

Chaplains' Branch

Rev. G. H. Piercy, M.A., to H.Q., Iraq Command, Hinaidi, 15.10.30.

IN PARLIAMENT

Night Air-Mail Services

Mr. Montague, on November 13, in reply to Mr. Mander, said the necessary ground organisation for night flying has been provided on the routes connecting London and many of the Continental capitals. The question of establishing non-stop night-flying services over these routes is, however, primarily one for decision by the operating companies concerned. I would add that a conference, at which the air and postal administrations of 10 European States were represented, was held last month in Brussels for the preliminary consideration of various questions connected with night air-mail services, and will be followed by another conference next spring.

National Flying Services, Limited

Captain Balfour, on November 17, asked the Under-Secretary of State for Air the reasons for the advance of money on account of the £10 Government grant for "A" licences yet to be earned by National Flying Services, Ltd. ; the security obtained by the Ministry against this advance ; and whether the Ministry have received any undertaking as to the repayment of this money by the company ?

Mr. Montague : The advance, at interest, was made in order to assist the company while they were arranging to obtain the further capital which the result of the initial year's trading showed to be necessary. Th ecompany agreed to recovery being made by the Air Ministry through the withholding of payments in respect of licence grants as earned, and further undertook to give to the Air Ministry a floating charge on all its assets to the extent of the loan outstanding, such charge to rank immediately behind that already given to the debenture holders. The company, having now obtained further capital, have decided to repay the advance in full, and the cheque sent for this purpose has been received by the Air Ministry.

R.A.F. Personnel

Mr. William Whiteley, on November 19, in reply to Mr. T. Lewis, said the numbers of personnel in the Royal Air Force paid for out of Air votes are (exclusive of those serving in India) as follows : 1926, 30,640* ; 1927, 28,139* ; 1928, 28,888* ; 1929, 29,240*‡ ; 1930, 32,000†.

* Average for the year.
† Estimated maximum allowed to be borne at any period of the year.
‡ On January 29, 1930, in reply to a question, a figure of 30,670 was given as the number of the Royal Air Force in July, 1929. This figure, however, included the R.A.F. in India.

Parachutes

Mr. William Whiteley, in reply to Capt. H. Balfour, said : Parachutes have now either been issued, or are on order, for all sea-going aircraft, except for one type which is obsolescent.

R.A.F. Commissions

Mr. Montague, in reply to Capt. Balfour, said 27 short-service commission officers were granted permanent commissions in the General Duties Branch, Royal Air Force, during the year ending October 31, 1930, and the number of officers holding short service commissions on that date was 837.

Air Navigators' Examination. Successful Candidates

The Air Ministry announces :—The following candidates, whose names are given in alphabetical order, have passed the examination for Second Class Civil Air Navigators' Licences, held at the Air Ministry on October 7, 8 and 9 :—Sergt./Pilot J. W. L. G. Brent, R.A.F. ; Sergt./Pilot W. Jenkins, R.A.F. ; Flying Officer C. E. Kay, R.A.F. ; Sergt./Pilot A. R. McMillan, R.A.F. ; Flying Officer G. M. Randall, R.A.F.O. , Flight-Lieut. R. A. Seaton ; Flying Officer R. O. O. Taylor, R.A.F.

The subjects of the examination were :—International Legislation—Form of the Earth, Maps and Charts—Meteorology—Dead Reckoning and Direction Finding W/T Navigation—The Earth's Magnetism and Compasses—Visual Signalling. To qualify candidates were required to obtain not less than 70 per cent. of the aggregate marks, with the exception of visual signalling and not less than 60 per cent. in any one subject, excluding visual signalling in which subject not less than 90 per cent. is required in order to qualify. The next examination will be held about March, 1931 ; the exact date will be announced later.

R.A.F. SPORT

INTER-UNIT RUGBY CUP COMPETITION

The following results have now come to hand :—

R.A.F. Depot, Uxbridge, *v.* **R.A.F., Ruislip,** played at Uxbridge, November 12. Result :—Uxbridge, 6 points (one try, one penalty goal) ; Ruislip, 5 points (one goal).

Martlesham Heath *v.* **Felixstowe** played at Felixstowe on November 12. Result :—Felixstowe, 10 points (2 goals) ; Martlesham, 4 points (1 dropped goal).

AIR POST STAMPS

By DOUGLAS ARMSTRONG

Belgium's Beautiful Air Stamps

THE recently issued air post stamps of Belgium are amongst the most artistic that have been produced in this particular line, with their finely engraved vignettes of postal 'planes soaring above the roadstead of Ostend (50 centimes bright blue), and the cities of St. Hubert (1·50 fr. purple), Namur (2 fr. blue-green) and Brussels (5 fr. claret). They are excellently reproduced in large square format by the Brussels firm of Sips Catoir, after the designs of the artist P. Goblet, who has been responsible for other recent Belgian stamps of merit.

Sweden's new air post stamps showing the arrival of a night-air mail at Stockholm are equally well conceived, but here we are left in doubt as to the author of this most effective engraving in miniature. Destined for use in connection with the Stockholm-Copenhagen-Hanover-Rotterdam service, the 10 ore value is printed in deep blue and the 50 ore in a rich purple.

The French air post vignette, face value 1·50 fr., is an almost equally pleasing production, recess printed in deep carmine, with a picture of one of the transatlantic aeroplanes leaving the old port of Marseilles, engraved by A. Mignon after the design of Albert Laurens.

Air Stamp Novelties

The pocket principality of Liechtenstein, between Austria and Switzerland, is the latest European country to issue special stamps for aerial postage in connection with a regular service that was put in operation between Vaduz (the capital) and St. Gallen (Switzerland) to link up with the Swiss air mail system on August 30, 1930. The set of six values shows views of aeroplanes passing over glaciers, the valley of the Rhine and the Castle of Vaduz, beautifully reproduced in photogravure from the designs of Herrn H. C. Kosel, of Vienna. They comprise 15 rappen sepia, 20 rp. steel-blue, 25 rp. brown, 35 rp. indigo, 45 rp. olive-green, and 1 fr. claret.

The territory of Papua has recently been provided with three permanent air post stamps for use on letters transmitted over the Australian air lines, in the form of contemporary 3*d.*, 6*d.*, and 1*s.* postage stamps distinguished by the imprint of an aeroplane in red, with inscription " Air Mail " upon its wings.

From Persia comes a very striking series of 17 stamps printed in rotogravure with two vignettes, one showing the head of the Shah Rizah Pelavi and the other an eagle in flight over a wild landscape with a glimpse of Mount Demavend's snow-capped peak in the background. Printed in brilliant colours by the Haarlem firm of J. Enschede and Sons, they range in value from 1 chahi to 3 tomans, and supersede the various emergency issues hitherto employed in the Persian air post service.

Bolivia also contributes an effective new set of stamps inscribed " Sobre Tasa-Correo Aereo," recess printed in two picturesque designs by the London firm of Perkins, Bacon and Co., Ltd. The first depicts an aeroplane over an up-country road, with an ox-wagon in the foreground, whilst the second illustrates a river scene with an aeroplane passing overhead. They were first employed on letters despatched by air mail from La Paz to Rio de Janeiro (Brazil) on July 30 last.

Air Stamp Values Still Soaring

Further sensational advances in the values of the scarcer varieties of air post stamps and covers are recorded in the newly published 6th edition of Champion's bi-lingual *Air Mail Catalogue*. Since the last edition appeared more than two years ago the cult of air post collecting has increased by leaps and bounds and many new records have been set up, both in and out of the auction room. The most valuable item is the 24 cents United States air stamp error with the centre printed upside down, now quoted at Fr. 70,000 (about £500): although a few years ago specimens were going begging at £150. Next in order of rarity comes the " Hawker " stamp of Newfoundland, valued at Fr. 25,000 unused, or Fr. 20,000 on " flown cover." The " De Pinedo " Air Mail stamp has jumped to Fr. 12,500 and the " Ross Smith " vignette of Australia to Fr. 20,000 and Fr. 16,500 respectively. Colombia, No. 1 is now listed at Fr. 10,000 unused and Fr. 5,000 " flown," compared with only Fr. 2,500 two years ago. Those collectors who have been steadily buying the better class air posts stamps during the past few years have no reason to regret their investment.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1200 (*Ae.* 361).—On the Problem of Hydrodynamic Stability. I.—Uniform Shearing Motion in a Viscous Fluid. By R. V. Southwell, F.R.S., and L. Chitty. January, 1930. Price 2*s.* 6*d.* net.

The Care and Maintenance of Aircraft. Reprinted from " Aircraft Engineering." Airways Publications, Ltd., 6, Norfolk Street, Strand, London, W.C.2. Price 3*s.* 6*d.*

The Aeronautical Diary, 1931. Aldershot: Gale and Polden, Ltd. Prices, 1*s.* 6*d.*, 2*s.*, 3*s.*, 7*s.* 6*d.*, and

IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.
For 1912 and 1913, see FLIGHT for January 17, 1914.
For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1927 being given in FLIGHT, January 17, 1930.

	Imports.		Exports.		Re-exports.	
	1929.	1930.	1929.	1930.	1929.	1930.
	£	£	£	£	£	£
Jan.	2,852	2,987	74,307	147,935	100	—
Feb.	6,532	2,460	195,369	226,049	2	1,000
Mar.	1,210	744	204,664	156,098	90	802
April	5,816	2,959	186,477	213,390	115	79
May	4,706	11,706	243,549	158,460	1,245	2,550
June	9,304	15,029	144,817	252,443	750	1,060
July	6,961	14,216	139,695	170,594	—	938
Aug.	16,706	5,382	160,625	146,564	4	6,912
Sept.	510	2,757	237,303	109,363	9,686	1,730
Oct.	6,226	3,502	297,879	140,225	1,370	355
	60,823	61,742	1,884,685	1,721,121	13,362	15,426

NEW COMPANIES REGISTERED

INDIAN TRAVELLERS, LTD., High Holborn House, 52, High Holborn, W.C.1.—Capital £100 in £1 shares. Carriers of passengers and goods by land, air and water. Directors R. S. Nehra and E. M. Nehra, 121, Preston Road, Wembley.

MARCUS H. HODGES & SONS (ENGINEERS), LTD., City Basin Ironworks, Haven Road, Exeter.—Capital £10,000 in £1 shares. Objects: Aeronautical, agricultural motor, etc., and general engineers, welders by electrical and other processes, etc. First Directors: M. H. Hodges, M.I.Mech.E., " Welivere," Saltford, near Bristol, engineers' technical manager (governing director). W. B. H. Hodges, Lothair Villa, Driver Square, St. Thomas, Exeter, works manager. A. J. M. Hodges, " Beandize," Alphington, near Exeter, sales manager.

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1929

Published November 27, 1930.

23,243. J. RAPP. Monogrammic adverising apparatus for use on aerial machines. (316,518.)
23,701. W. V. GILBERT. Supporting surfaces or wings of aircraft. (337,452.)
24,113. W. H. GRAY. Aeroplanes. (337,480.)
32,310. M. POPELAKOVA (née BURIANOVA). Aviators' equipment. (337,588.)
33,766. SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT, LTD., and J. LLOYD. Landing-gear for aircraft. (337,603.)
35,916. G. CAPRONI. Fuselage fitted with arrangement for carrying and dropping large bombs. (337,630.)

APPLIED FOR IN 1930

Published November 27, 1930

4,431. J. TROJANI. Helicopters. (337,698.)

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